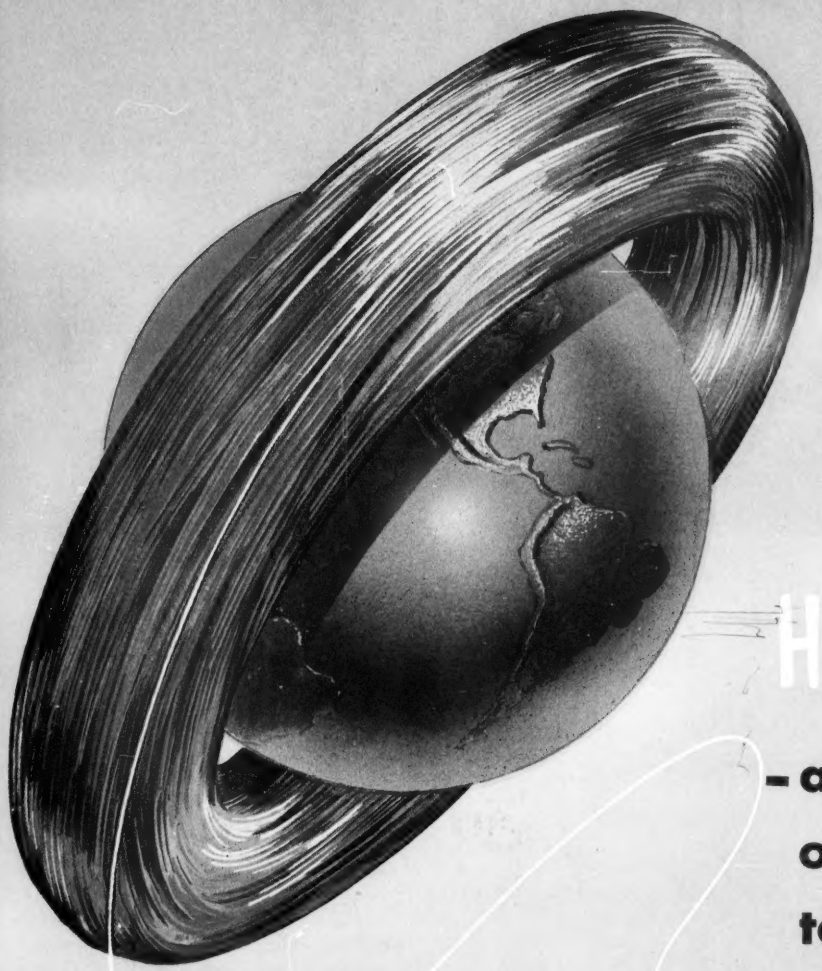
JANUARY 1955

WIRE AND WIRE PRODUCTS



Happy New Year

- and a world of good wire to you

THE VAUGHN MACHINERY COMPANY
CUYAHOGA FALLS, OHIO, U.S.A.

COMPLETE COLD DRAWING EQUIPMENT .... Continuous or Single Hole ... for the Largest Bars and Tubes ... for the Smallest Wire ... Ferrous, Non-Ferrous Materials or their Alloys.

"Quick on the Draw!"
VAUGHN MACHINERY
PROFITABLY USED BY LEADING WIRE MILLS SINCE 1871

OFFICIAL PUBLICATION OF THE WIRE ASSOCIATION

Payoffpak...

it's new...it's different... it's ideal for handling and processing WIRE!

PAYOFFPAK—Continental's newest fibre container—offers wire manufacturers and fabricators a revolutionary new development in wire packaging, handling and dispensing.

SAVES WORK—Wire is automatically packaged in the Payoffpak as it is drawn, eliminating such operations as stripping, tying, handling, splitting and wrapping.

SAVES TIME—Payoffpak can hold 600 lbs. Downtime on the wire drawing machine, due to stripping operations, is greatly reduced.

ELIMINATES REELS—Single standard-size Payoffpak eliminates reels and need for wide range of block sizes.

CUTS SHIPPING COSTS—Inexpensive, light-weight Payoffpaks travel for less because of extremely light tare weight.

HANDLES AND STACKS EASILY—In-plant handling of Payoffpaks is easy with conventional hand trucks. High stacking strength means you can use maximum storage space, too.

A survey indicates that often more than 50 labor steps are needed to convert 500 pounds of steel wire in standard eight inch coils—but you can do the same job with Payoffpaks in an average of five operations. No wonder they are calling this new container "the long-playing record of the wire industry" See how Payoffpaks can pay off for you. Call Continental for complete information on this exciting new way to package, handle and dispense wire.

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I am an integral part of fine craftsmanship.

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I inspire respect and confidence.

I assure acceptance of your work.

I am often not seen. But I am a most important ingredient.

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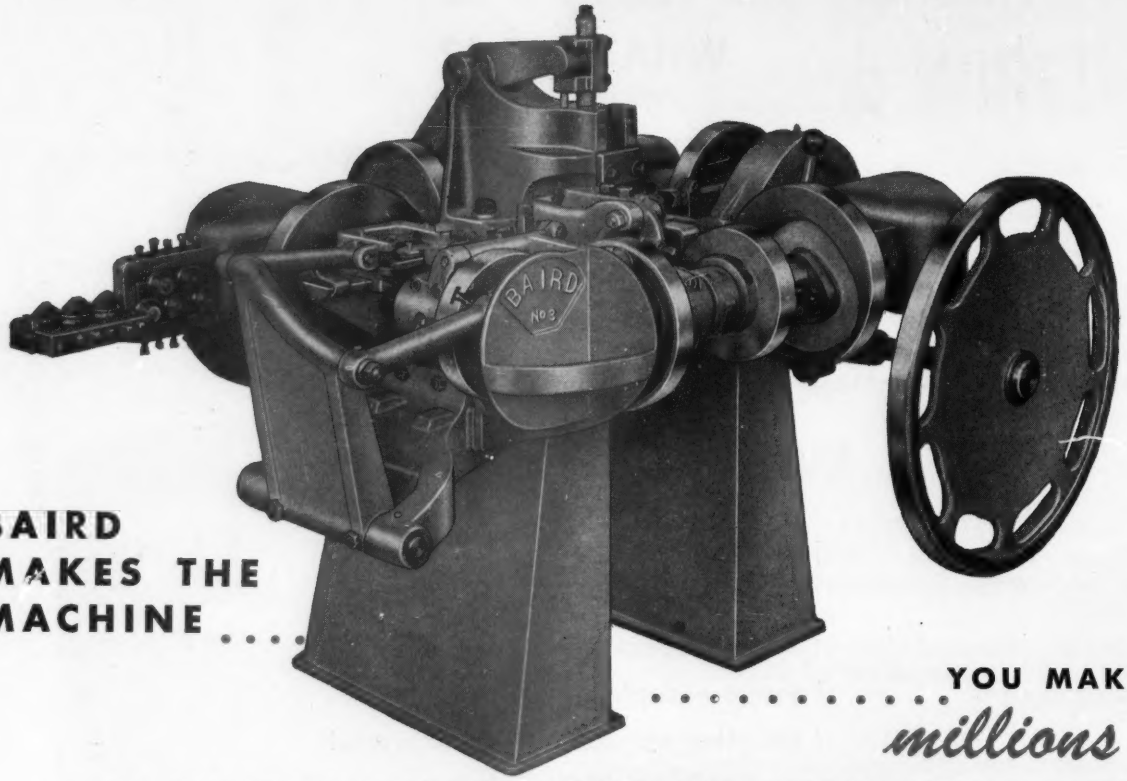

BAIRD MAKES THE MACHINE . . . . . YOU MAKE *millions*

. . . OF ACCURATELY FORMED WIRE AND RIBBON METAL PARTS

The Baird automatic Four-Slide Machine produces an extremely wide variety of articles made of any commercial wire . . . round, half-round, square, or flat . . . at highest speeds. It takes coiled wire from a reel, straightens, feeds, and cuts off the required length . . . then forms and ejects the part produced. Eight sizes handle shorter wire lengths; three sizes take longer lengths to 32½".

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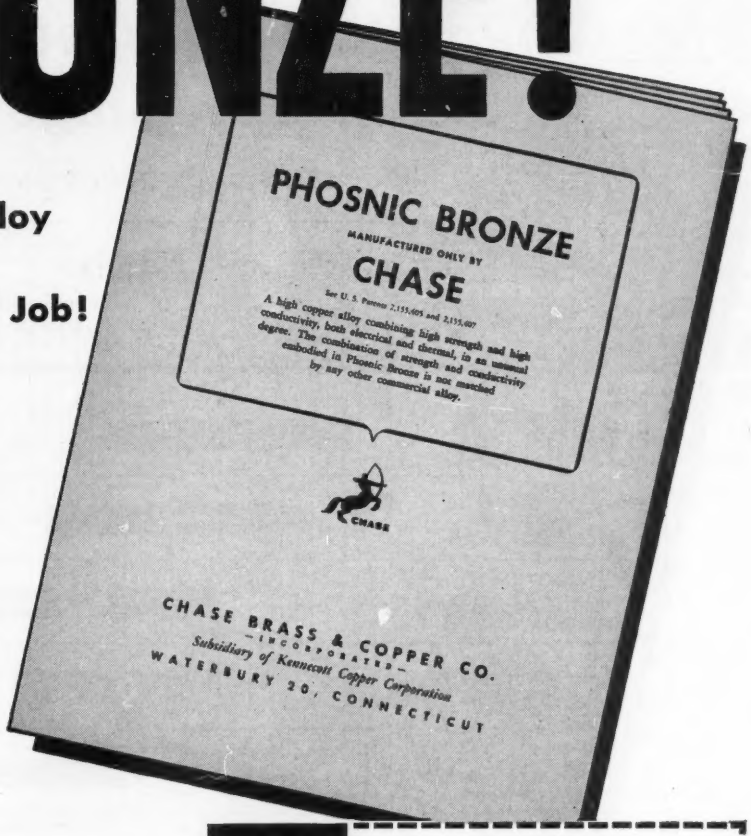
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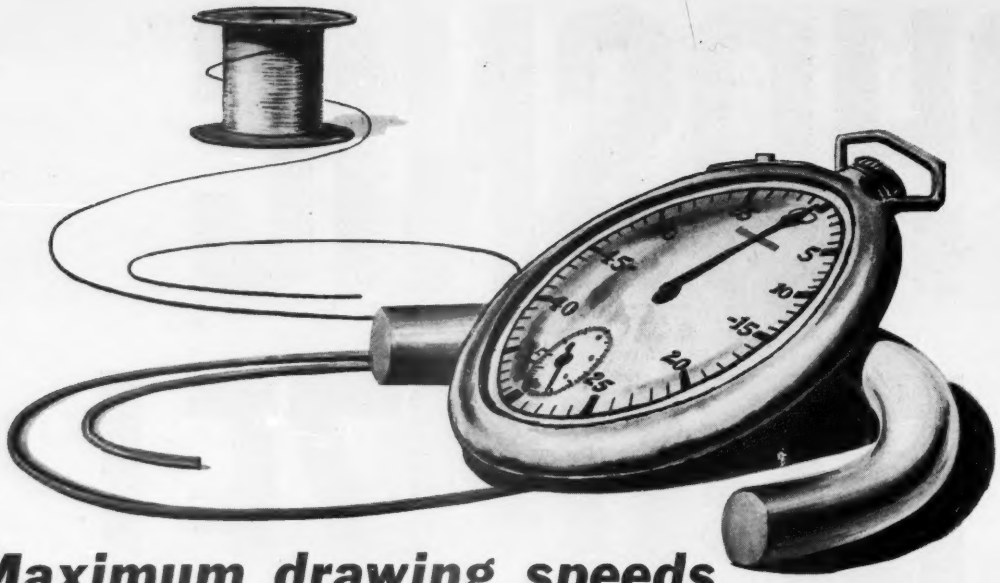

***Maximum* drawing speeds**

for *any* gauge *from rod breakdown to fine wire in copper, aluminum and their alloys*

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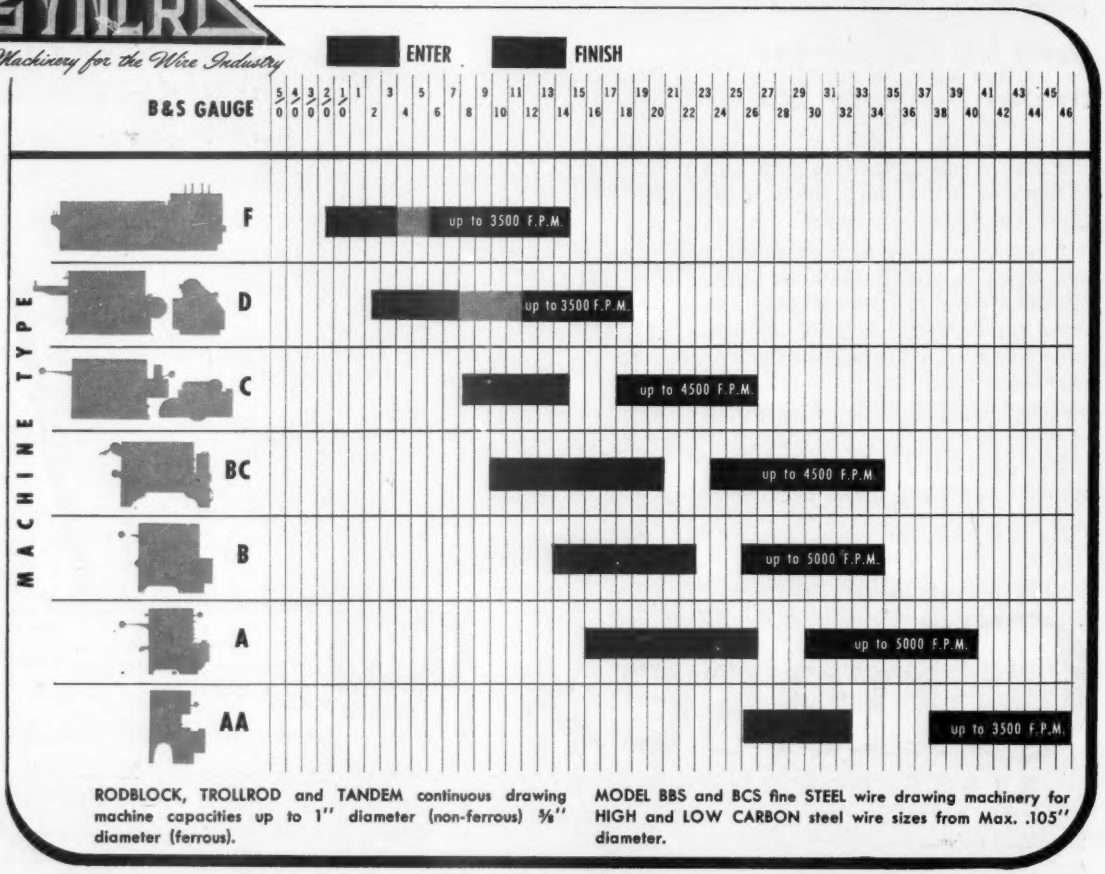
Better Machinery for the Wire Industry



RODBLOCK, TROLLROD and TANDEM continuous drawing machine capacities up to 1" diameter (non-ferrous) ⅜" diameter (ferrous).

MODEL BBS and BCS fine STEEL wire drawing machinery for HIGH and LOW CARBON steel wire sizes from Max. .105" diameter.

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WIRE AND WIRE PRODUCTS*

Reg. U. S. Pat. Off.

A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable.

DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 30 January, 1955 No. 1

Designated as Official Publication By The Wire Association

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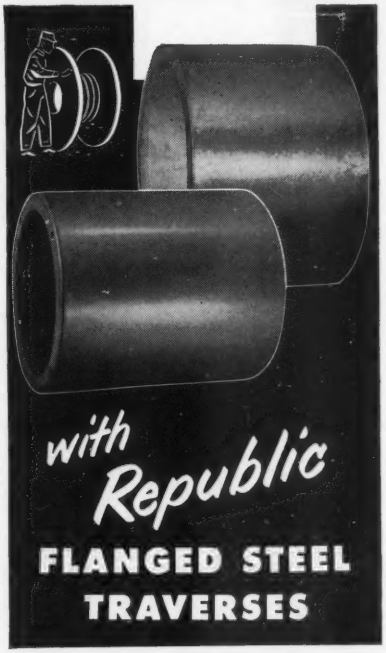
For Wire and Cable Reels



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FLANGED STEEL
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1. Insert bolts through wooden head
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Single Length Wire Coils Up to 580 # Catch Weight

GET THESE ADVANTAGES WITH OUR NEW HEAVY WEIGHT COILS IN 26" DIAMETER.

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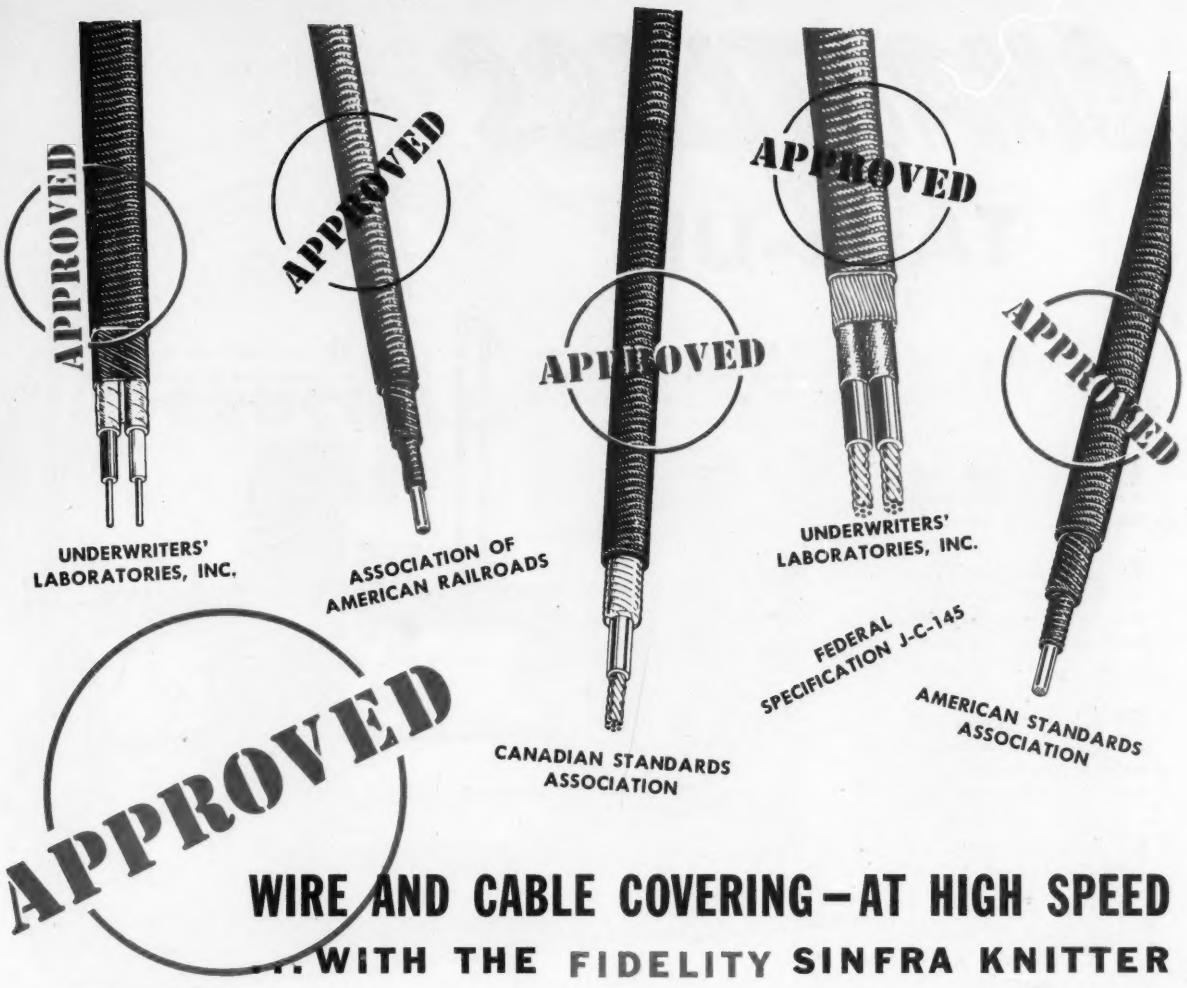
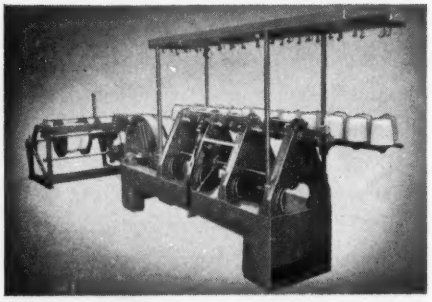
CONTINENTAL STEEL



WIRE AND CABLE COVERING—AT HIGH SPEED ...WITH THE FIDELITY SINFRA KNITTER

WEATHERPROOF WIRE • BUILDING WIRE • NON-METALLIC SHEATHED CABLE • SERVICE ENTRANCE CABLE • OTHER GOVERNMENT & INDUSTRIAL WIRES



Sinfra Machines are available for covering wire sizes up to and including 500,000 C/M.

Your wire and cable can carry all the important stamps of approval—when you use Fidelity Sinfra Knitters in your covering operations. Wire and cable produced with these high speed wire covering machines meet the highest standards of recognized testing bodies . . . carry their authorized approval for industrial and military application.

Leading manufacturers agree, too, that the Sinfra Knit process has proven superior to conventional braiding methods of wire and cable covering. A Fidelity Sinfra Knitter covers up to 2500 feet of wire or cable per hour. Automatic electric stop motions and accurate product control permit the production of a better product at lower cost.

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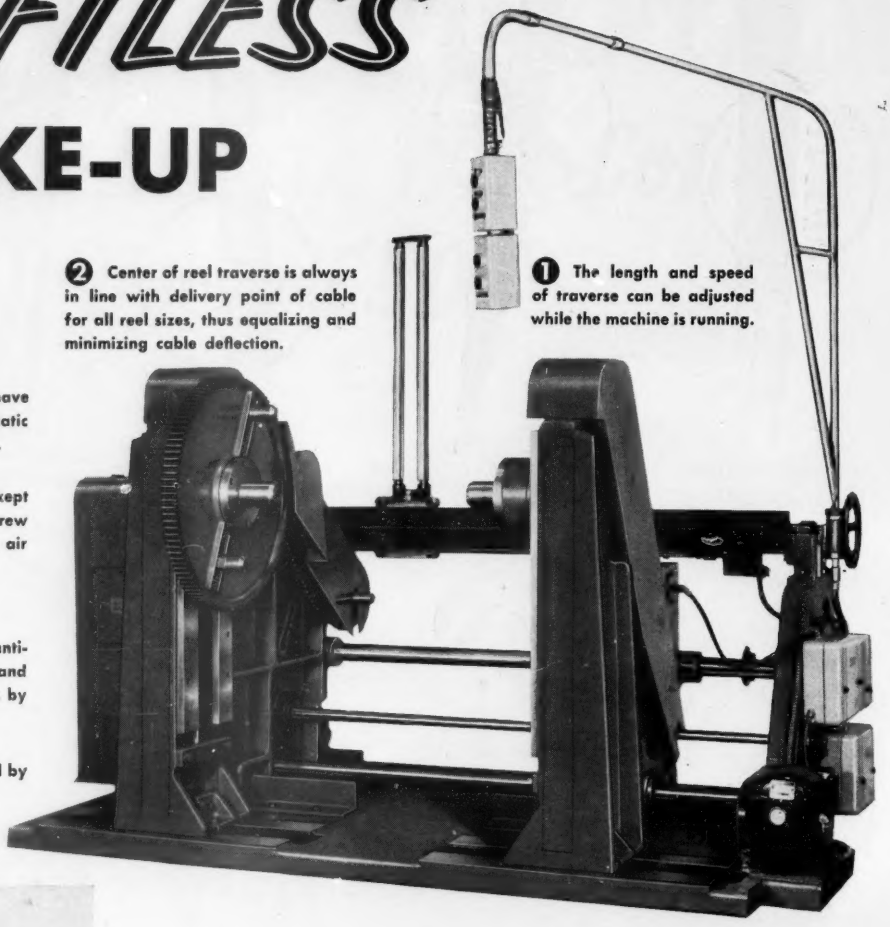
SHAFTLESS TAKE-UP



❶ The length and speed of traverse can be adjusted while the machine is running.

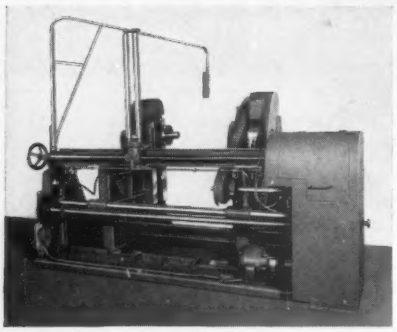
❷ Center of reel traverse is always in line with delivery point of cable for all reel sizes, thus equalizing and minimizing cable deflection.

❸ Reel gear and drive pinion have a special tooth form for automatic engagement when reel is raised.

❹ Light cable tensions are kept uniform by reversing traverse screw direction by means of solenoid air valve and compressed air.

❺ Both reel frames with anti-friction bearing pintles move in and out of engagement with the reels by means of a motor-driven screw.

❻ Reels are raised and lowered by motor-driven screws.



Available for reels of following sizes:

36" diam. to 52" max. diam.
36" diam. to 72" max. diam.
36" diam. to 84" max. diam.
42" diam. to 96" max. diam.

This heavy duty Take-Up is the newest addition to our line of wire reeling machinery. It handles bare or insulated cables of all weights at a wide range of speeds . . . and profitably. Swinging pendant push button station provides quick and convenient operator control. A multiple disc slip friction drive that can be adjusted while the Take-Up is running, or independent motor drives, can be supplied. This versatile machine speeds the production of high quality cables and can be adapted by our engineers to satisfy the special requirements of your plant. Write us for further information and details. New England Butt Company, 304 Pearl Street, Providence 7, R. I. James Day (Machinery) Ltd., 28 Maddox St., London W 1, England.

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now available — all sizes... all tempers

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Our new fine wire mill is equipped with the latest facilities for annealing, pickling, drawing and finishing. Our mill metallurgical control setup is the latest word, too, to assure you that every spool and coil produced conforms to Crucible's high standard of quality — dimensional, physical and surface uniformity that is unsurpassed in the industry.

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REX HIGH SPEED • TOOL • REZISTAL STAINLESS • MAX-EL • ALLOY • SPECIAL PURPOSE STEELS

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- Assures reinforced, continuous bond between barrel and head.
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- Traverse and heads may be joined in your plant by simple hand arbor, foot, or power press operation.
- For space and transportation economy — spools shipped in separate head and traverse units.

Tailored for Safety:

- Snagging or tearing of wire eliminated by full curl at outer edge of head — also by perfectly smooth inside surface at juncture of barrel and head.
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BY J. L. CLARK

Colorful Package Styling:

- Complete creative design service — insuring instant brand identification, and product salability.
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Inquire today about Clark's complete spool line — precision engineered for insulated wire, automotive cable, radio and television wire, and wire solder. Sizes now available include 3-3/4″ diameter heads with 1-15/16″ diameter traverse; 5″ and 6-1/2″ diameter heads with 1-15/16″ diameter traverses; and 10-1/2″ diameter heads with 3-1/2″ diameter traverses. Traverse lengths up to 12″.

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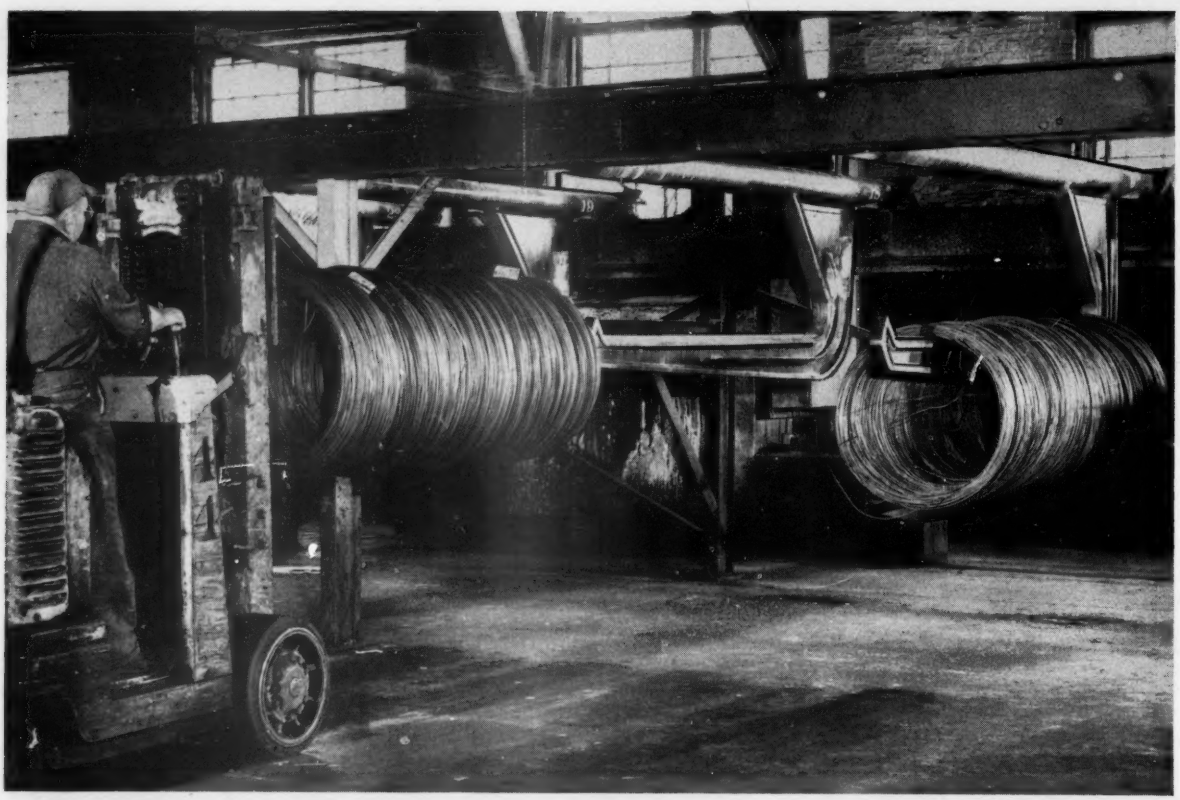

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Greater Strength—and Extra Protection at the "Acid Line"

IN plants and wire mills all over the country, WELDCO Fabricated Pickling Hooks are replacing heavy, old-style hooks. For plant managers and engineers are discovering that WELDCO Fabricated Hooks are stronger, lighter in weight, easier to handle, more corrosion-resistant, and carry heavier loads . . . easily and safely. And here's another important reason: Because of their superior design, WELDCO Monel or Stainless Steel Hairpin Hooks give extra protection at the "acid line," where ordinary hooks usually fail. This feature alone will add many extra years of service life!

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WELDCO

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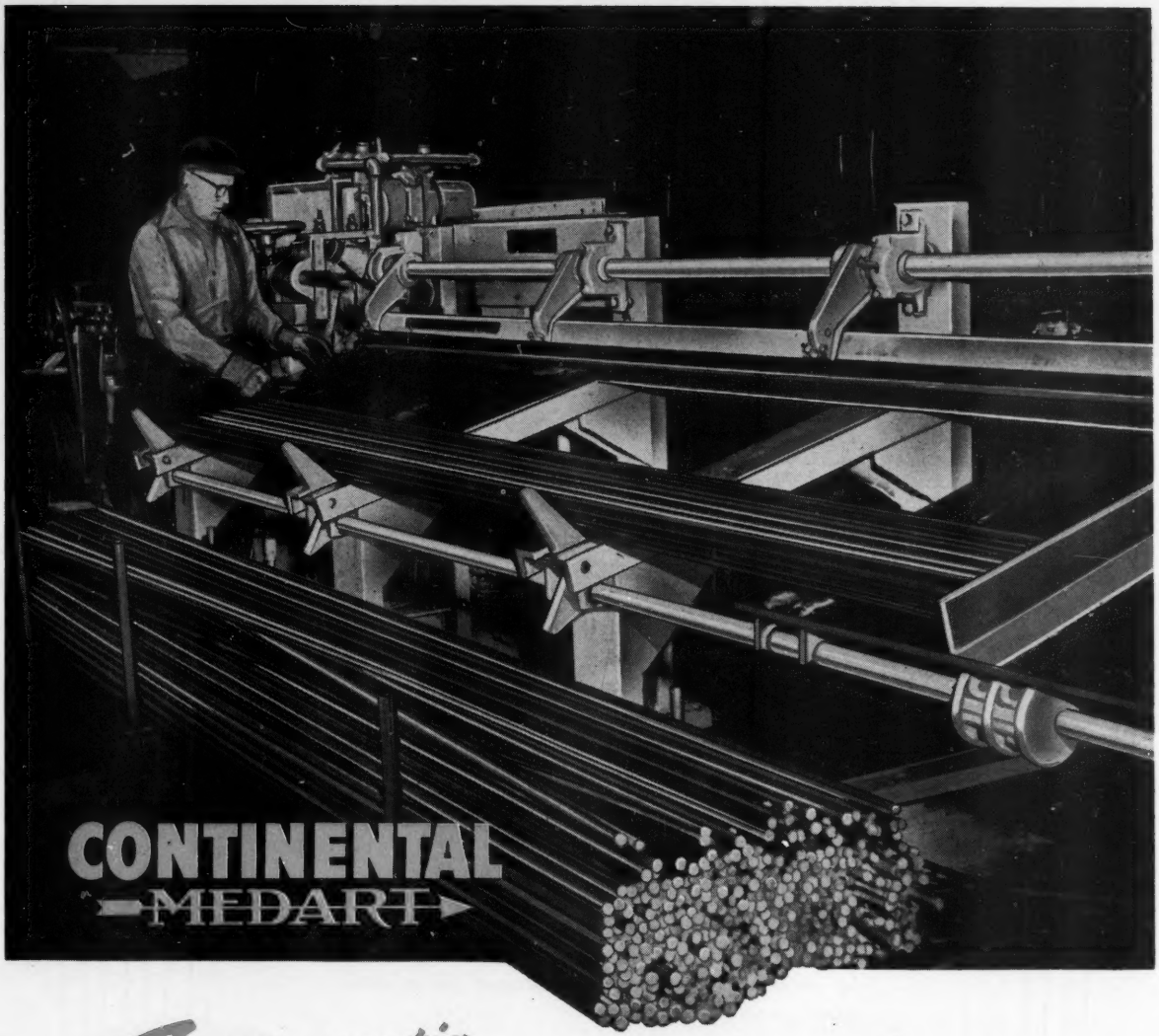

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Write today for information.

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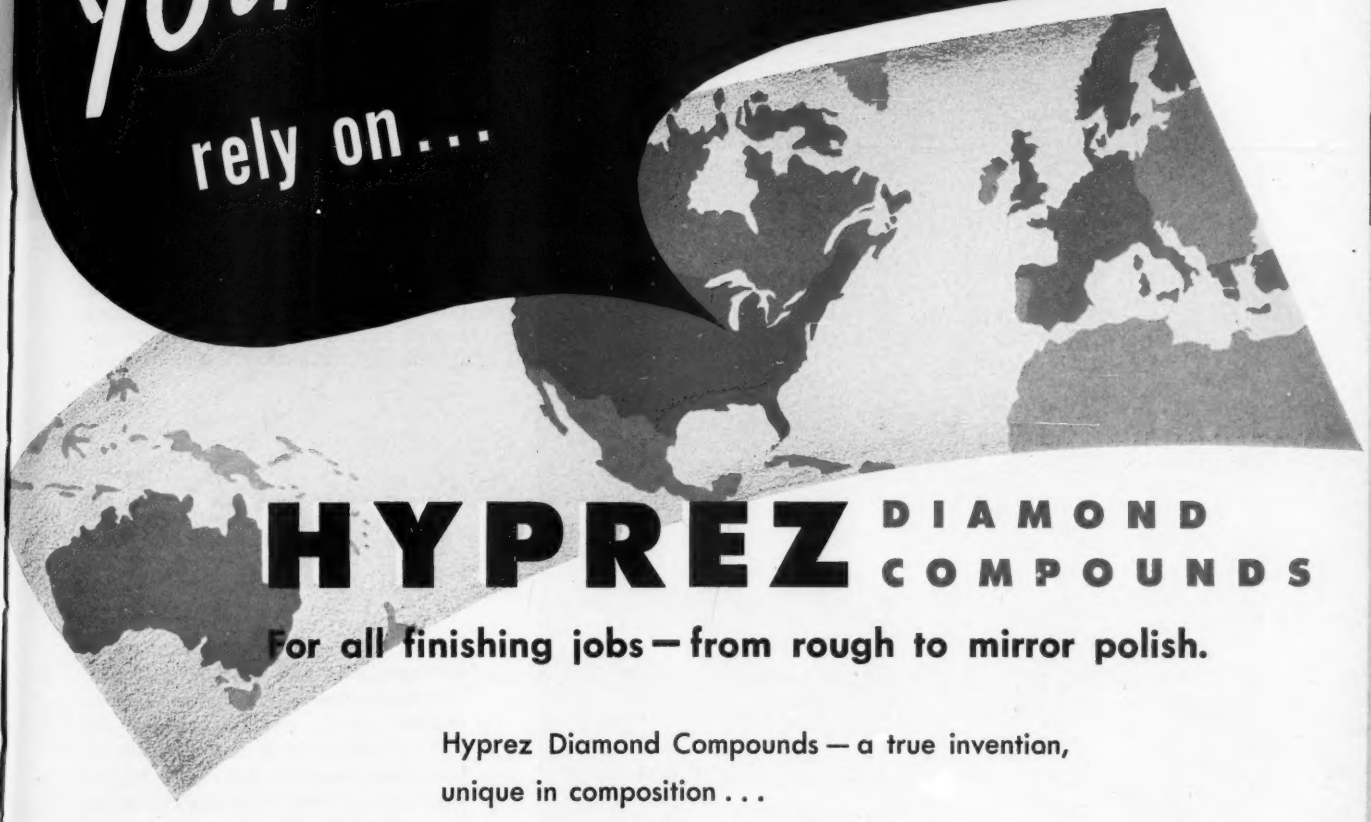

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For all finishing jobs — from rough to mirror polish.

Hyprez Diamond Compounds — a true invention, unique in composition . . .

- Are used in 19 foreign countries, in addition to the United States and Canada.
- Are patented in Switzerland, Sweden, Great Britain, and France.
- Are manufactured under exclusive license in Great Britain, Switzerland, and France.

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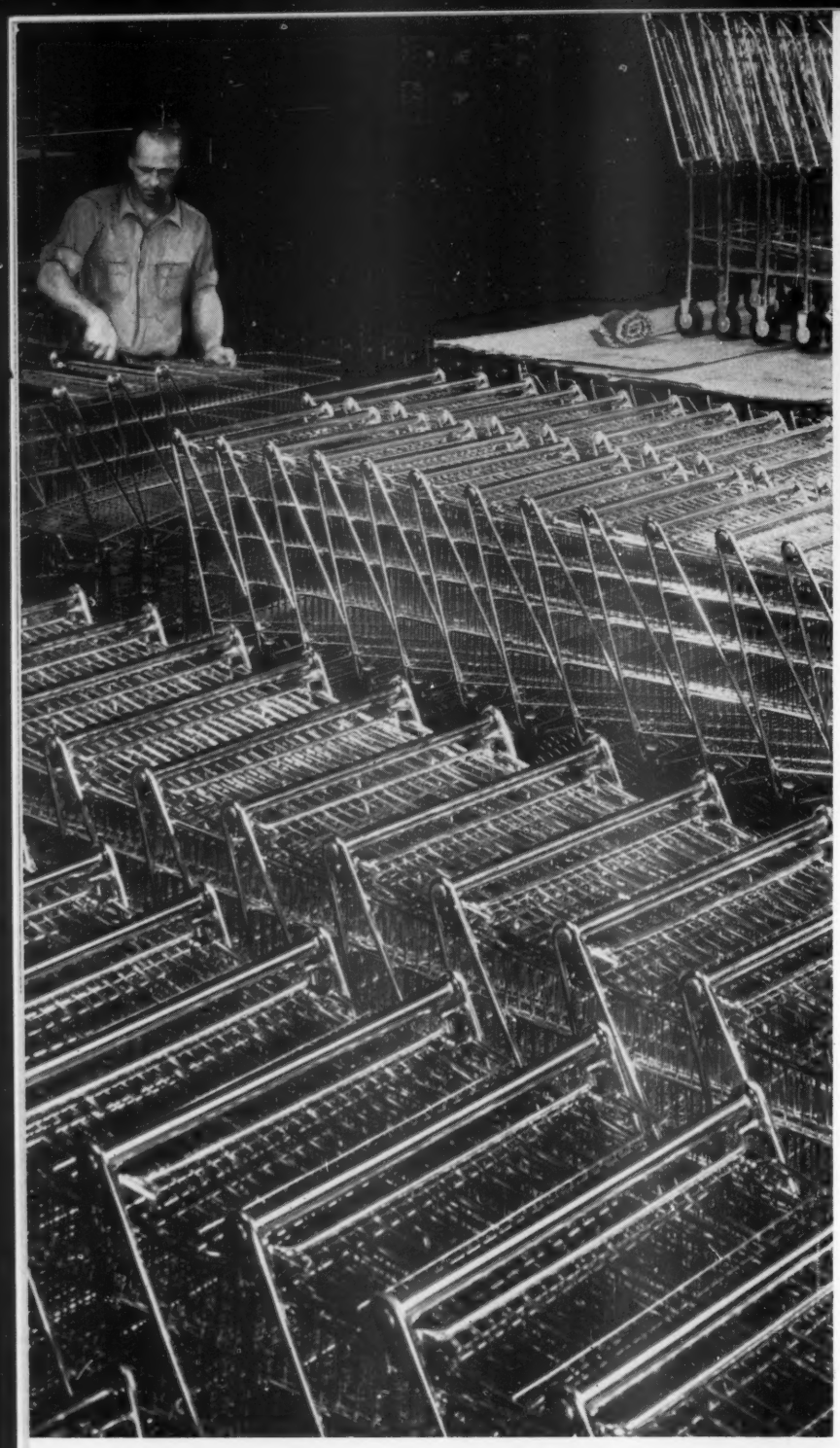
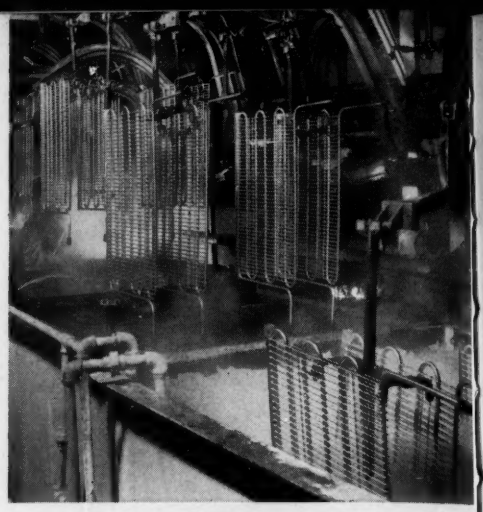


1. The Shopping Carrier you use at supermarket or grocery, made of welded steel wire, may have come from United Steel and Wire Company where a variety of models are produced at a 500-a-day clip. Finish must be extra smooth to prevent torn packages.



2. Home Freezer Shelves are given a bright chrome finish on this automatic plating line. Steel wire must be clean and smooth as plating will magnify the slightest surface imperfections.

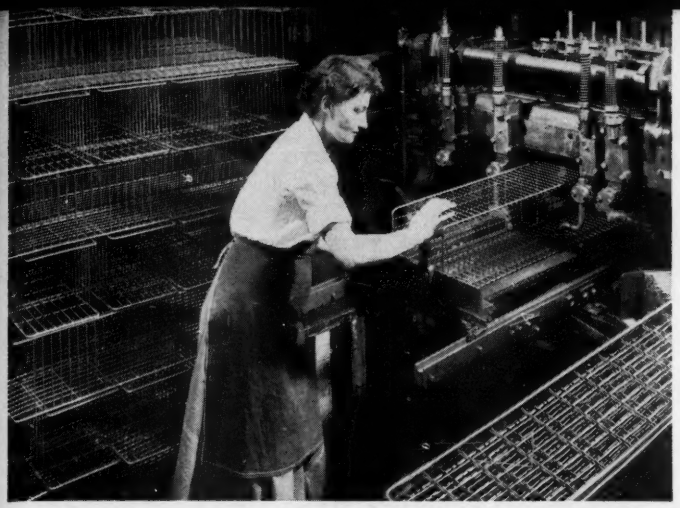
Steel

Truly, the uses for steel wire seem inexhaustible, and Pittsburgh Steel Company makes wire for nearly all of them.

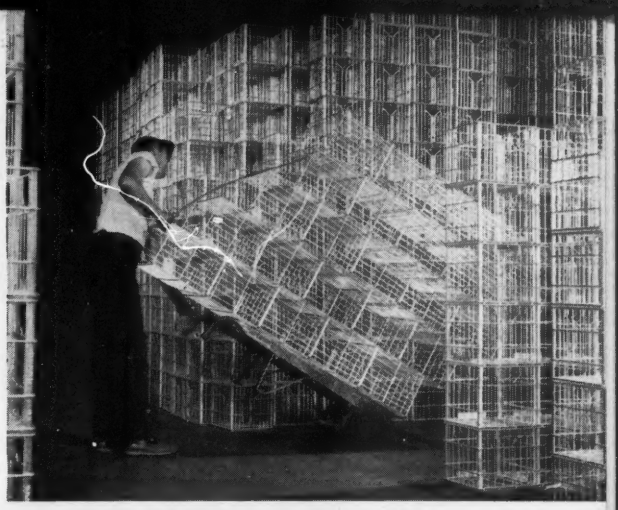
Yet today a whole new field of uses has emerged, one that is expanding so fast there has been little effort to tabulate its growth. This is the market for formed wire products. The uses of steel wire have taken on a whole new dimension as more and more formed wire products are designed and built for everything from grocery carriers to bird cages.

• **Creative Minds At Work**— Formed wire products are not entirely new. Perhaps they began with the first coat hangers, bustles, or wire-backed chairs. But since World War II, the myriad uses produced by creative designers have opened broad new horizons. Today you find steel wire going into such diverse products as utility containers, modern furniture, letter holders, wall decorations, and outdoor grilles.

To quickly grasp the size of this new dimension, take a look at one of the nation's leading producers of formed wire products—United Steel and Wire Company of Battle Creek, Michigan. Since the end of World War II, it has



3. Ice Cream will be frozen in these hardening cases. Once welded, the wire is galvanized to protect against corrosion. United holds forms and jigs for 400 special sizes.



4. Your Milkman may deliver your milk on one of these wire bottle crates made by United at a rate of 3,000 daily. Sturdily built, yet light in weight, they have self-cleaning features.

Wire Takes On A New Look

nearly doubled the size and scope of its operations.

In one year United produces some 4,500,000 shelves for several well-known makes of home refrigerators; 875,000 shelves for commercial refrigerators; 900,000 milk crates and ice cream hardening cases; 750,000 baskets of various types; 100,000 grocery carriers; and additional hundreds of thousands of point-of-sale display stands; outdoor grilles; beverage cases; dish racks; and bird cages. To make these products, United uses about 15,000 tons of wire annually—an important share of it from Pittsburgh Steel Company.

Structural advantages of formed wire products include strength and rigidity with light weight. Wire construction provides for self cleaning and permits air or liquid circulation.

• **Importance Of Quality**—Steel wire that goes into these products ranges in sizes from nearly one-half inch to less than one-tenth of an inch in diameter. It has to be strong, yet ductile enough for easy welding on intricate automatic multiple welding machines. It has to have an extra smooth and clean surface to permit chrome and nickel plating, galvanizing or painting, and produce an attractive yet durable finish.

To produce this wire, United relies on wire makers with long know-how. Pittsburgh Steel Company, one of United's important suppliers, has had more than 50 years' experience in wire making. Its range includes everything from large diameter basic bright wire to intricate specialty wires as fine as a human hair.

Pittsburgh Steel has long produced quality spring wire including low, medium and high carbon, and alloy; M. B. hard drawn; and oil tempered. It has a good reputation for production of quality ACSR core wire for cable, welding wire, rope wire, cold-heading wire, flat and shaped wire, rivet wire, screw wire, and nails. Its fabricated products include a full range of farm and lawn fence, chain link fence, and welded wire fabric for construction.

This combination of know-how and modern facilities enables Pittsburgh Steel to supply the kind of wire United needs for its broad line of formed wire products.

If you are making formed wire products, why not look into the opportunities with Pittsburgh Steel's basic bright wire and plating quality wire? Chances are good it will be worth your while to call the nearest district sales office to have a salesman call to discuss your problems and offer suggestions, or to give you information on prices and delivery. You'll find him ready to serve you right now!

"Everything New But The Name"

Pittsburgh Steel Company

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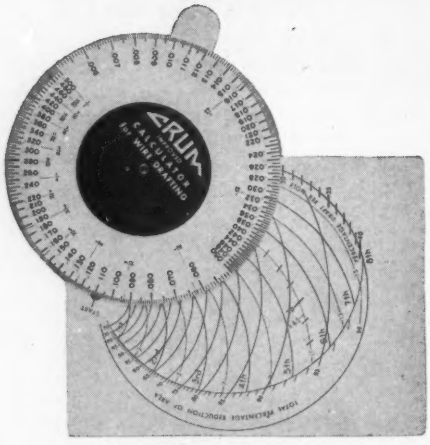
DISTRICT SALES OFFICES: Atlanta • Chicago • Cleveland • Columbus • Dallas Dayton • Detroit • Houston • Los Angeles • New York • Philadelphia • Pittsburgh San Francisco • Tulsa • Warren, Ohio. **PLANTS:** Monessen, Pa. • Allenport, Pa. Akron • Los Angeles • Unionville, Conn. • Warren, Ohio • Worcester, Mass.

Write for your copy of the color brochure "The New Pittsburgh Steel Company."

THE NEW and IMPROVED . . .

CRUM CALCULATOR

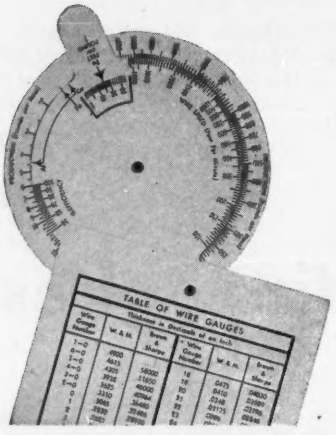
FOR WIRE DRAFTING



Front view of Crum Calculator.

THIS NEW DOUBLE-PURPOSE CALCULATOR WILL:

1. Provide quicker and more accurate information on die sizes and reduction areas;
2. Calculate wire production rates for various speeds and efficiencies.



Reverse view of Crum Calculator.

SOME OTHER FEATURES OF THE CALCULATOR

- Has new scale for more accurate determination of small percentages.
- Gives readings in B & S gauges.
- Intermediate lines provide reductions for 16 holes in one setting.
- New rectangular shaped back for better protection of calculator.
- More legible % draft-per-hole scale.
- Vinyl plastic construction, resistant to wear, warping, dirt, perspiration, wire drawing soaps—can be cleaned.
- Still fits your vest pocket.
- Handy tables of W & M and B & S gauges.
- Feet per pound calculating scale for steel, copper and aluminum wires.
- Durable, accurate, easy to use.

The improved Crum Calculator is worth its weight in gold in time saving —no laborious mathematical calculations necessary when you use it. Instruction sheet with examples accompany each Calculator. You should have one or more in your wire drawing department.

THE PRICE: $5.00 EACH

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WIRE AND WIRE PRODUCTS

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(Exclusive distributors)

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and our clients will tell you that by purchasing their reel requirements from us they have been able to keep their inventories at a very minimum because:

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WE ALSO SIMPLIFY THEIR PURCHASING BY ENABLING THEM TO SECURE FROM ONE SOURCE.

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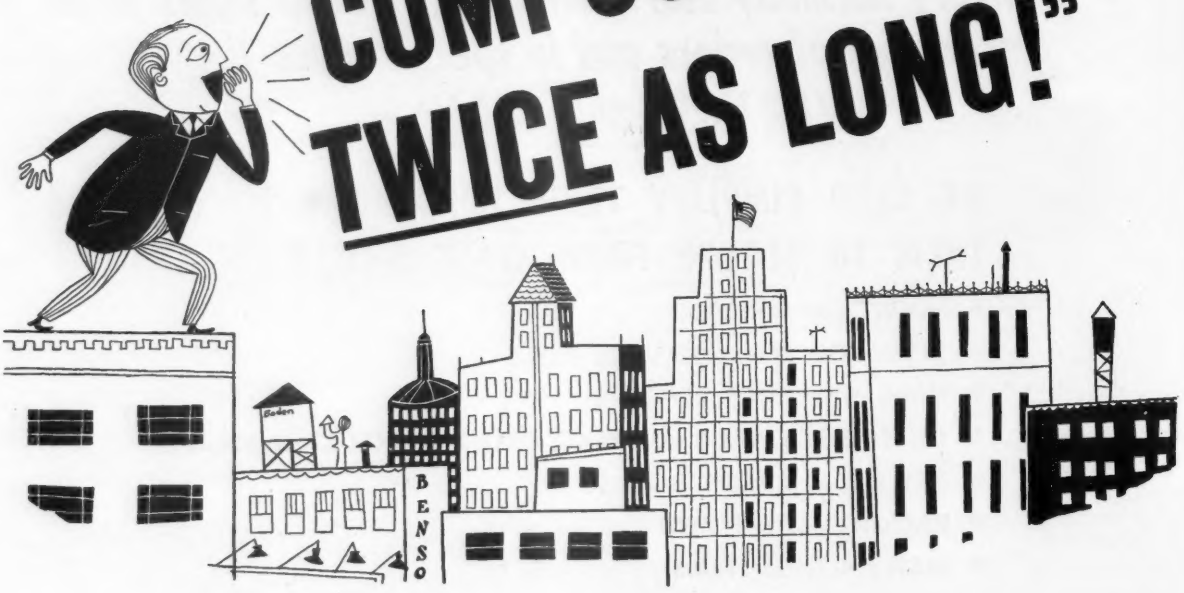

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for intermediate wire

DURPON L
for rods, tubes, heavy wire

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a Long Way

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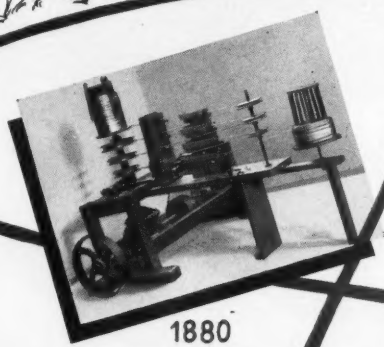
The invention and development of the submerged wire drawing machine is linked inseparably with the name HERBORN.



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leads from the first wet-drawing machine

1955

to the modern, highly efficient multi-draft wire drawing machines using the submerged system.

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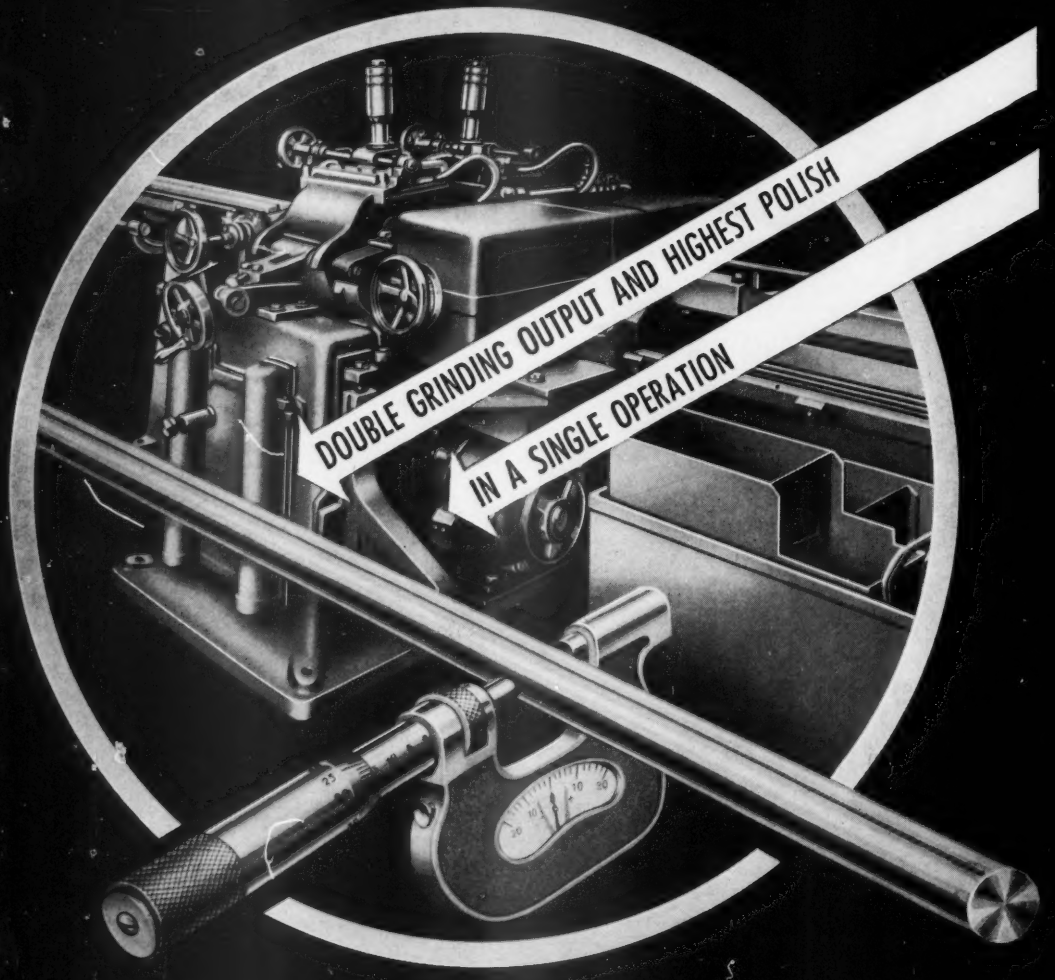

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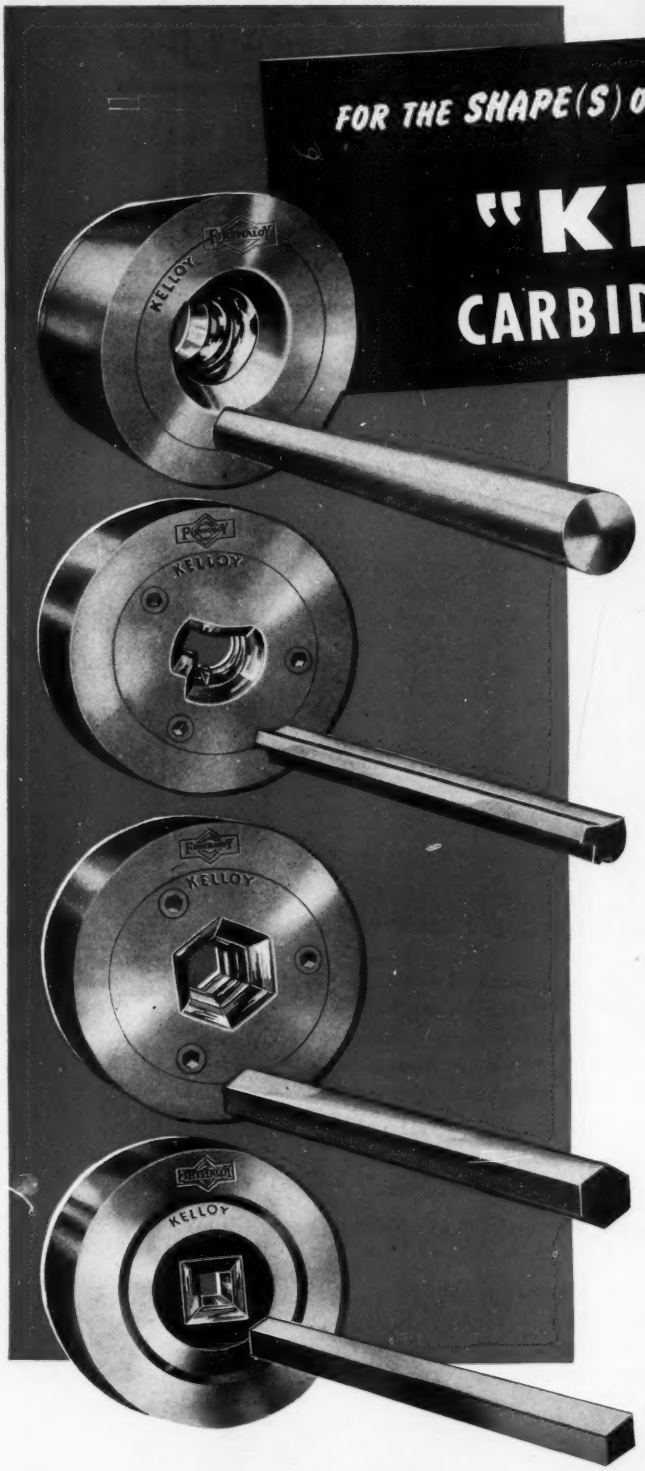

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"KELLOY" CARBIDE SHAPE DIES

A die shaped to wire manufacturers specifications, enabling him to satisfy the most exacting customer, demands a combination of experience and engineering not readily available in the average tool room.

That combination of experience and engineering is as much a part of Kelloy as the famous Firthaloy rough cores used in actual production.

The satisfaction of Kelloy performance can be yours too. Our engineering staff is available to assist you with your drawing problems. Simply write or telephone for price list or information.

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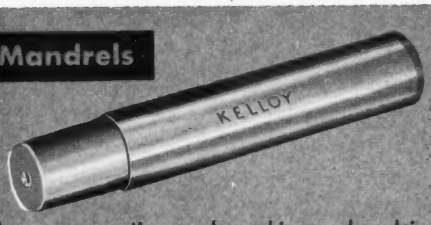

The same exacting workmanship employed in Kelloy shape dies, assures the superior carbide mandrel for your every tubing requirement.

Authorized distributors and finishers of FIRTH STERLING die materials

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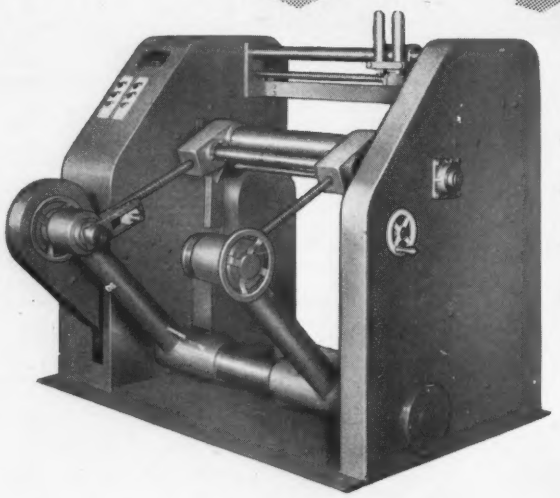
SHAFTLESS TAKE-UP

Eliminates the use of Reel Shafts



OUTSTANDING FEATURES

- Motor-driven reel lift with automatic stop with reel loading position.
- Handwheel adjustment with indicator for reel width adjustment.
- Traverse mechanism infinitely adjustable for traverse, lay and starting position.
- Hardened steel guide rolls adjustable to cable diameter.

Machine made in the following reel capacities.

Reel Dia. - - - - - - 24" Min. to 48" Max.
24" Min. to 50" Max.
30" Min. to 60" Max.
36" Min. to 72" Max.
36" Min. to 78" Max.
42" Min. to 84" Max.

Reel Width - - - - - - - - 48" Max.

Reel Weight - - - - 16,000 lbs. Max.

DESCRIPTION

The frame is of heavy fabricated steel construction of sufficient rigidity for the specified load and is mounted on a steel bed plate. The reel lift arms are of heavy steel tubular construction and are fulcrumed on a hollow steel sleeve. The reel pintles are mounted on anti-friction bearings and are moved into engagement with the reel arbor holes by means of a handwheel. Heavy roller-chain drive is fully guarded.

Reels are lifted by means of motor-driven screws. The reel raising and lowering motor is automatically controlled to lower to the reel diameter being used. Two sets of reel pintles are furnished to fit reel arbor holes as specified.

The take-up drive is available in various combinations to meet customer specifications. These may include:

1. Infinitely-variable drive, cable tension controlled.
2. Straight motor drive.
3. Adjustable constant-reel-shaft-speed.
4. External drive.

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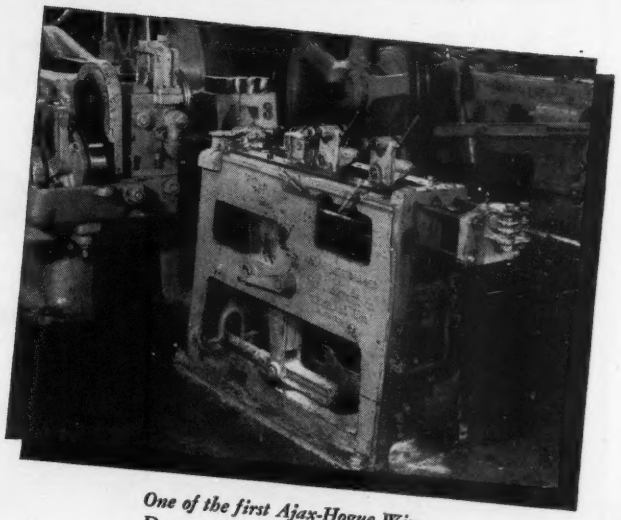
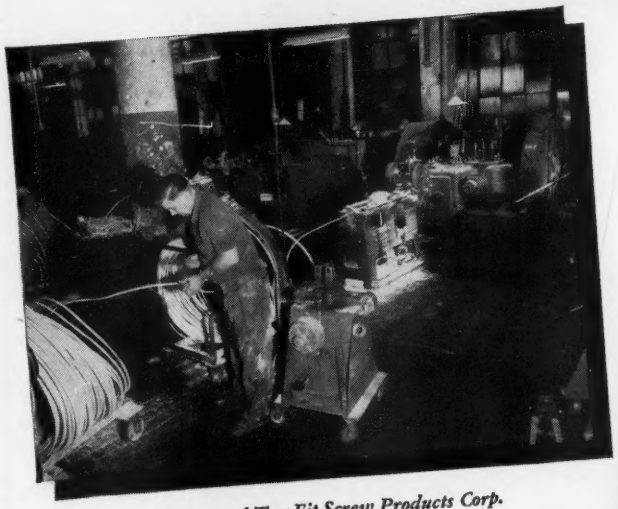
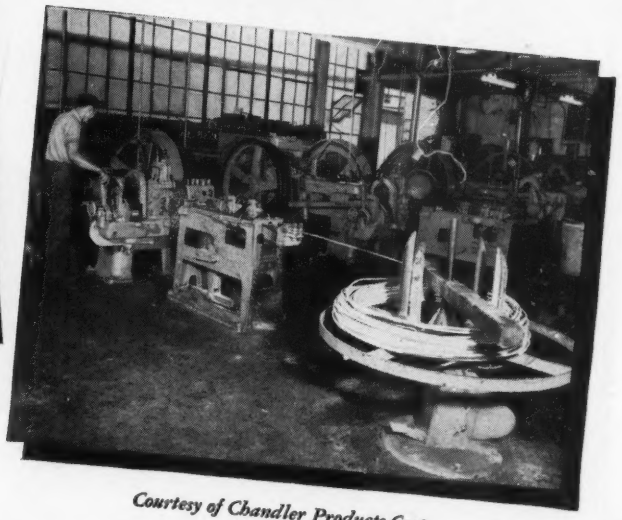
AJAX-HOGUE Wire Drawers



One of the first Ajax-Hogue Wire Drawers Built. Still in operation at the Chandler Products Corp. Cleveland, Ohio



Courtesy of Tru-Fit Screw Products Corp. Cleveland, Ohio



Courtesy of Chandler Products Corp. Cleveland, Ohio

These Ajax - Hogue Wire Drawers Have Been Drawing Accurate and Straight Wire from Coiled Rods for Cold Headers Since 1934

— write for Bulletin No. 111-A —

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Recently developed, Elgin's Master Comparison Gages are designed to permit accurate microscopic inspection of diamond abrasives. It means that now—right in your own plant with your own microscope—you can make a fast and efficient check of diamond particles for grading and degree of purity. You can check the proper particle size range, the quantity of fines and the presence of impurities.

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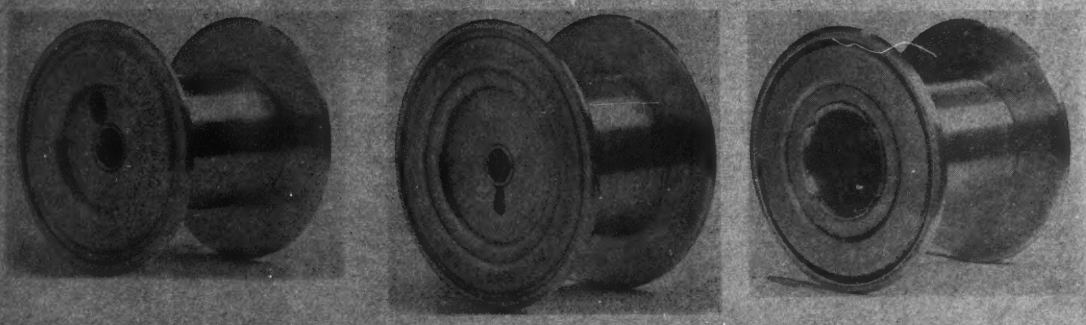

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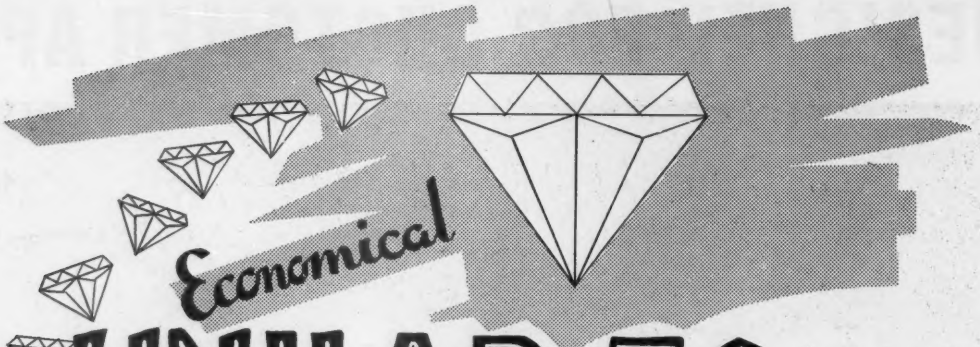

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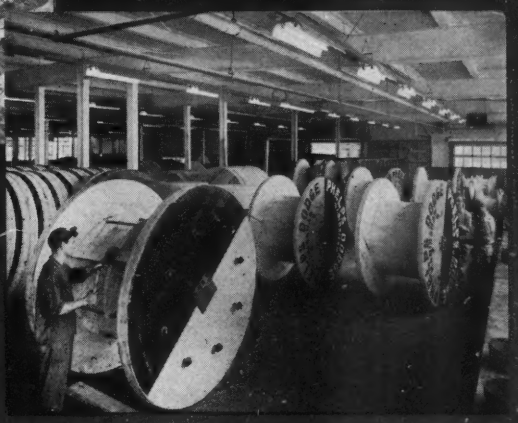

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IN STOCK:

- 3 Sinfra Knitting Machines, Model C-3H, 12 x 12 x 14 Needles.
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- 9 Syncro BB-13 13 Die Wire Drawing Machines, 8" Blocks.
- 1 Hartig No. 3 Plastic Extruder, complete with oil supply tank, 30 H.P. motor, drum and control.
- 1 Hartig No. 2 Plastic Extruder, complete with 20 H.P. motor, drum and control.
- 1 N. E. Butt 30" Take-Up Stand.
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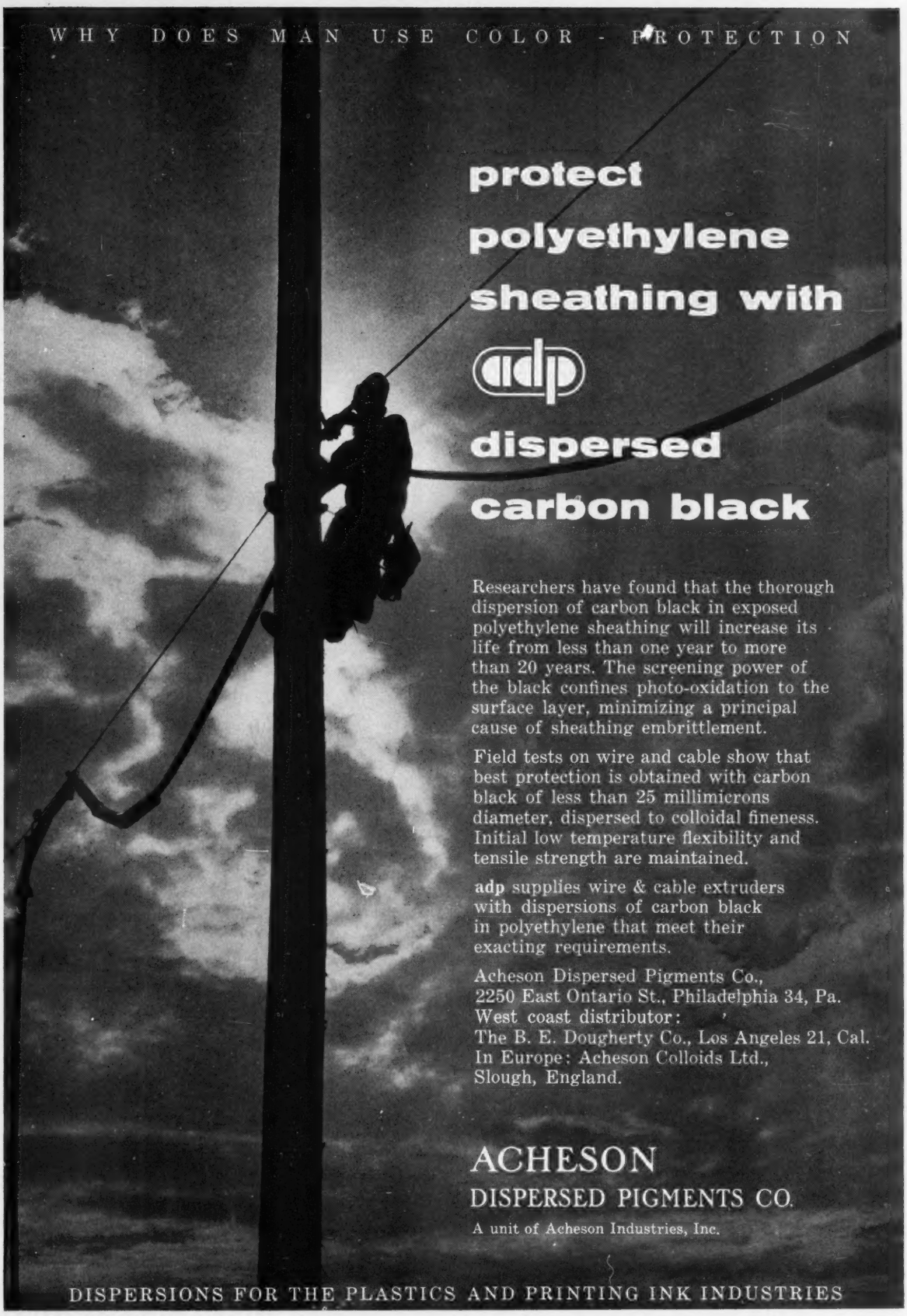
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Researchers have found that the thorough dispersion of carbon black in exposed polyethylene sheathing will increase its life from less than one year to more than 20 years. The screening power of the black confines photo-oxidation to the surface layer, minimizing a principal cause of sheathing embrittlement.
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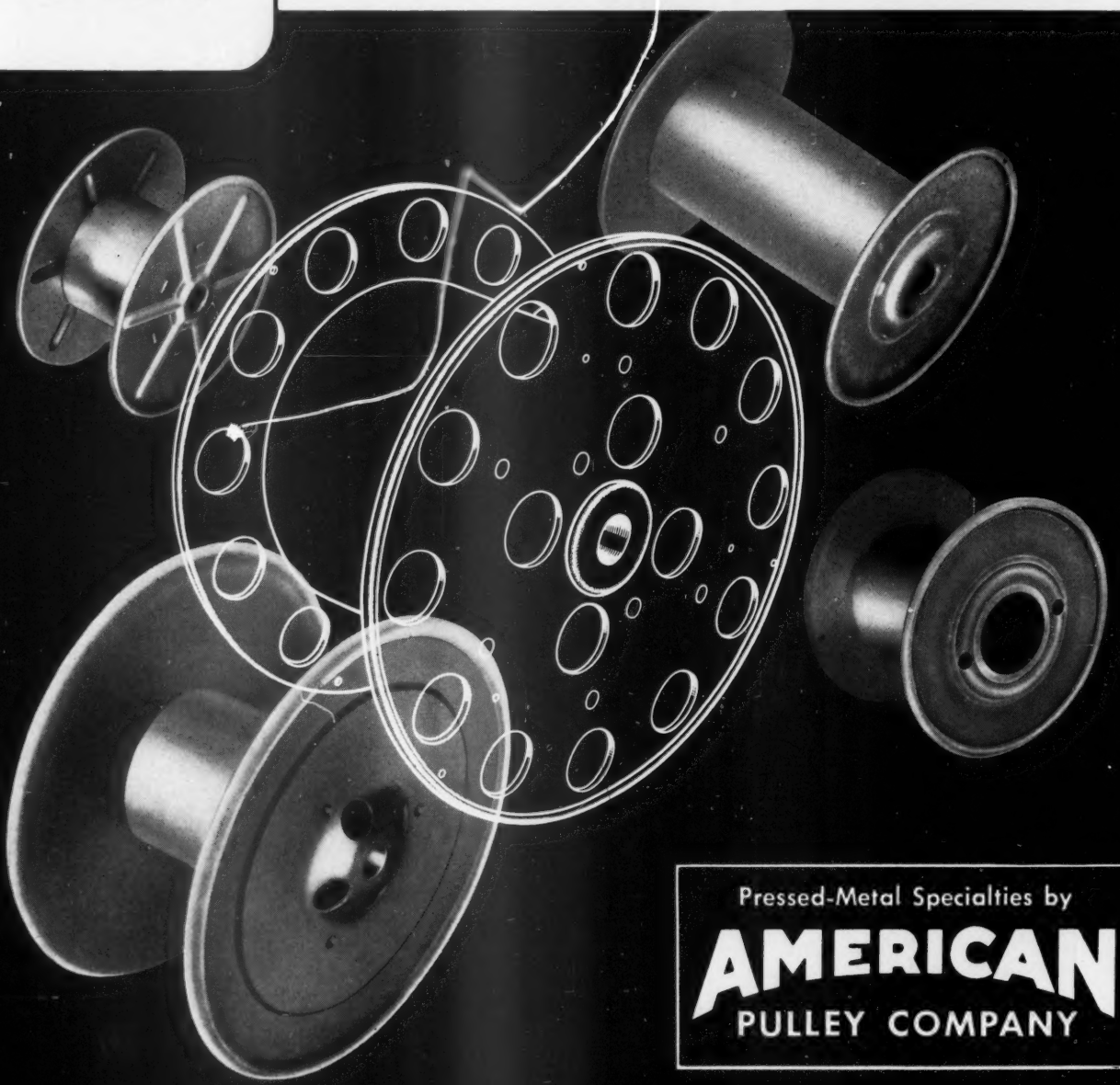

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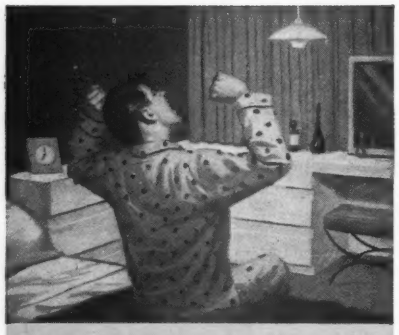
round the clock with

CF&I-WICKWIRE WIRE

Here, in these scenes, we take you through a typical day in the life of John Q. Citizen . . . showing you the extent to which CF&I-Wickwire Wire enters into the everyday activities of his home and business life.



7:00 A.M.—BEDROOM. John's day starts with the ringing of his alarm clock. There's wire in the mattress and bedspring. In the lampshades and drapery hooks. Bobby pins, safety and common pins in his wife's dressing table—to mention just a few.

7:15 A.M.—NURSERY. Here's the crib from which young John helps the alarm clock to rouse his dad. No less than nine different kinds of wire, go into its making. His toys and his tricycle—even the zippers on his clothes make use of CF&I-Wickwire Wire.

7:30 A.M.—KITCHEN. Let's inspect the kitchen. In the range and the refrigerator there are wire racks. The kitchen utensils, wire strainers, electric mixer, the egg slicer, the toaster, and dozens of other appliances all use CF&I-Wickwire Wire in their construction.

8:55 A.M.—OFFICE BUILDING. John never stops to think about it but he rides up to work on dependable elevator cable. Without this indispensable wire product—much of it made of CF&I-Wickwire Wire—modern buildings would be unable to function.

9:00 A.M.—OFFICE. Here we are, inside John's office. Where is the wire? All around us. Paper clips inside the desks. Springs inside the telephones and the typewriters—even under John's swivel chair. Staples, coat hangers and ring binders are also made of wire.

3:00 P.M.—FACTORY. Let's accompany John on a trip to his firm's nearby factory. The premises are inclosed by a wire fence. Inside, we find wire mesh cloth used as machinery guards. Metal processing belts made of woven wire. Plus springs of every variety.

For the Wire You Require—Check CF&I-Wickwire

CF&I-WICKWIRE WIRE

THE COLORADO FUEL AND IRON CORPORATION

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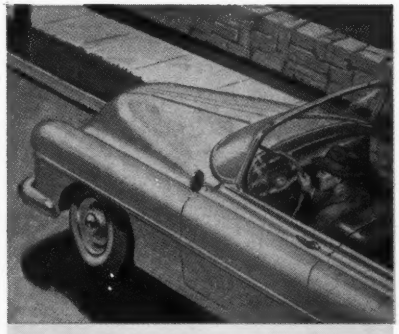
2772

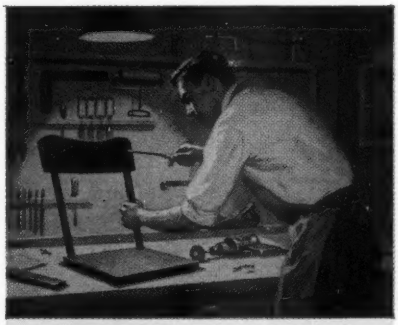
8:30 A.M.—GARAGE. A lucky fellow, John rides to work every day in his car. This is his garage. Notice that it has a smooth-operating overhead door. What makes it swing up? A large spring. And—you guessed it—it's made from CF&I-Wickwire Wire.



8:35 A.M.—AUTOMOBILE. CF&I-Wickwire Wire contributes much to the comfort and efficiency John gets from his car. There's wire in the springs of the seat and back cushions. Also under the hood in the valve springs and the starter spring.

8:45 A.M.—HIGHWAY. Notice the ribbon of concrete over which John's car rides smoothly to its destination. Many people, just like John, fail to realize that what holds it together is Welded Wire Reinforcement Fabric—another important wire product.

6:00 P.M.—HOME. This is John's house. Note that a sturdy chain link fence protects his privacy and property. On his windows you'll find insect wire screening. Springs on his doors. TV Guy Wire on the roof. Flower bed borders in his garden.

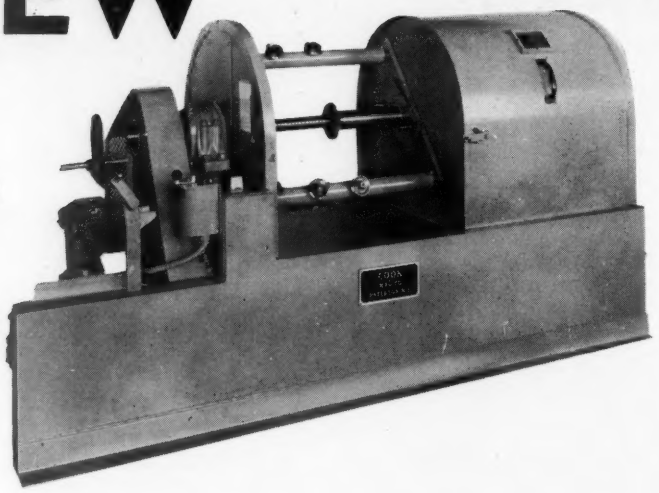


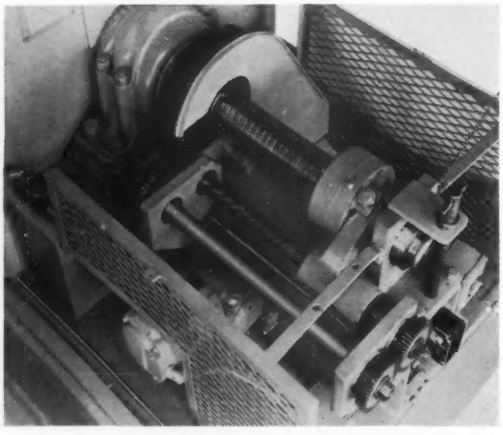
8:00 P.M.—WORKSHOP. John is a "do-it-yourself" man. This is his workshop. He probably doesn't realize it but the screw driver he's using is made from wire. Also the wire brush on his buffing wheel. And, of course, indispensable nails and screws.

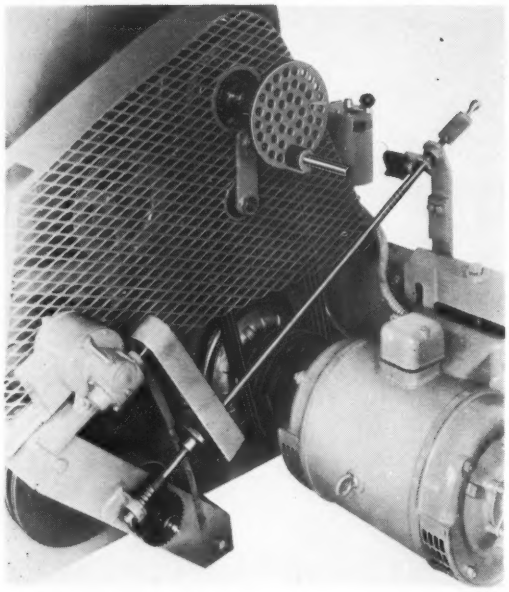
9:30 P.M.—LIVING ROOM. Here, we see John relaxing in the comfort of his living room, where wire is used in many forms. Upholstery springs in his furniture. Wire in his TV set. Lampshade wire and picture cord wire. Even the fireplace screen is made of wire.

GREAT NEW Buncher...

with twice the reel capacity!







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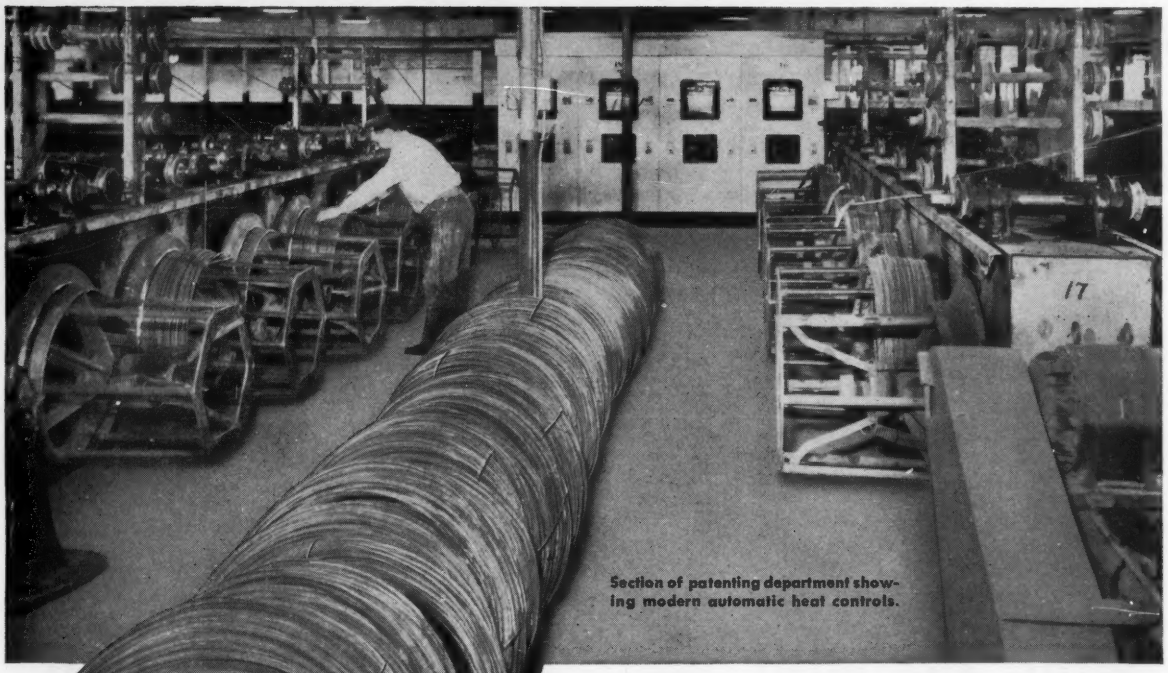

Section of patenting department showing modern automatic heat controls.

wire control

to save you money!

• The accuracy with which your wire specifications are met, *and held,* quite naturally has an important bearing on the cost, speed and quality of your production. That's why you can profit by National-Standard's facilities and exceptional experience in producing fine wire of many metals and alloys for exacting needs.

Here, all phases of wire processing . . . drawing, cleaning, heat treating, plating, finishing . . . are controlled to a degree and accuracy never exceeded, not often equalled. It's a firmly rooted National-Standard policy that can save you time and money.

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REYNOLDS WIRE	*Dixon, Illinois*	Industrial Wire Cloth
WAGNER LITHO MACHINERY	*Jersey City, N. J.*	Metal Decorating Equipment
WORCESTER WIRE WORKS	*Worcester, Mass.*	Round and Shaped Steel Wire, Small Sizes

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Write today, sending your order or for rates, if you don't have them.

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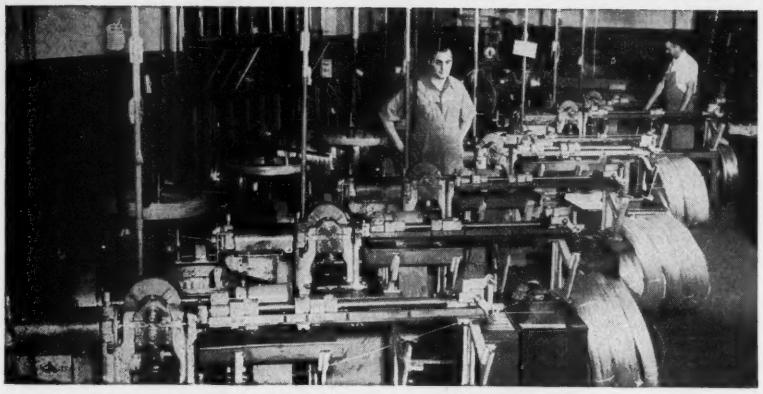
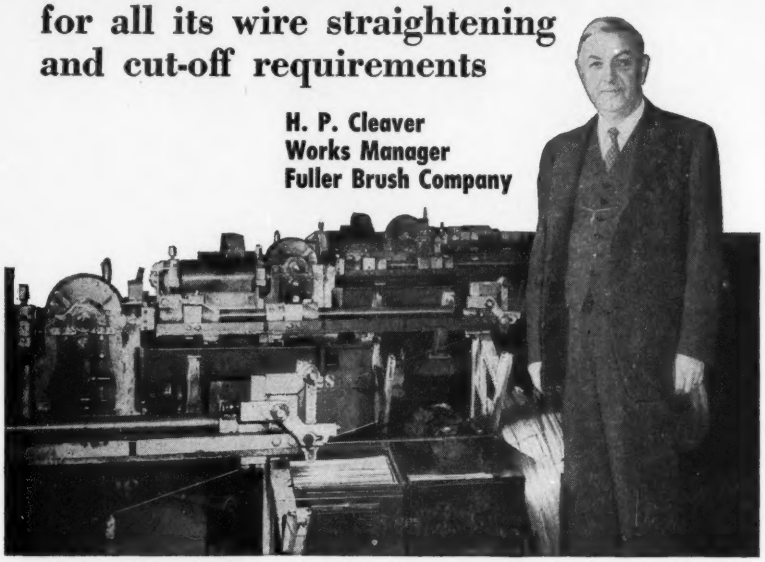


FULLER DEPENDS ON SHUSTER....

for all its wire straightening and cut-off requirements

H. P. Cleaver
Works Manager
Fuller Brush Company



Every Fuller twisted-in-wire brush, famous throughout the world, is produced with wire straightened and cut to length by Shuster Wire Straightening and Cut-off Machines!

Fuller has been using Shuster machines for many years; since 1948 a battery of seven Shusters have been in full production, often on double shifts, dependably straightening and accurately cutting wire for the special Fuller-designed Brush Twisting Machines. The Fuller people have found their Shusters to be highly dependable servants, sturdy, accurate and extremely economical.

Shusters are available for .025" to 11/16" diameter wire; shapes, flat stock, tubing. Write us your requirements.

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SHUSTER
AMERICA'S OLDEST NAME IN WIRE STRAIGHTENING & CUTTING
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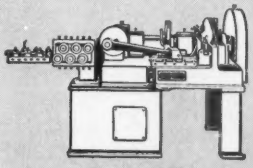
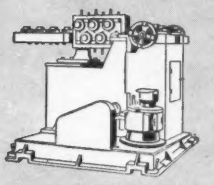


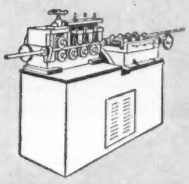
SLIDE FEED STRAIGHTENERS

3/8" x 10"; 9/16" x 10"



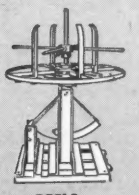
FEED STARTER AND STRAIGHTENER

Max. 5/8" dia.



TUBE AND BAR STRAIGHTENER

7/32" to 5/8" bar 1" tubing



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Look! No Hands!

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Brass	Plastic	Aluminum
Insulated Wire	Low Carbon Steel	Tubing
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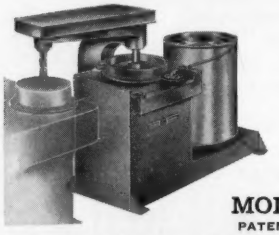
Magnet Wire	Multiple Strand	Rivet Wire

SPEEDS to suit all materials and operations.
POWER to pour the finest strand or reduce and package the coarsest material.

LOW COST ADAPTERS FOR EXISTING BLOCKS



MODEL 126
PATENT PENDING

Write for engineering questionnaire. Models available for vertical or horizontal block conversion.

Other machines are available for continuously drawing and packaging fine and coarse wire.

*Steel Wire.

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Just one in a wide variety of . . . .

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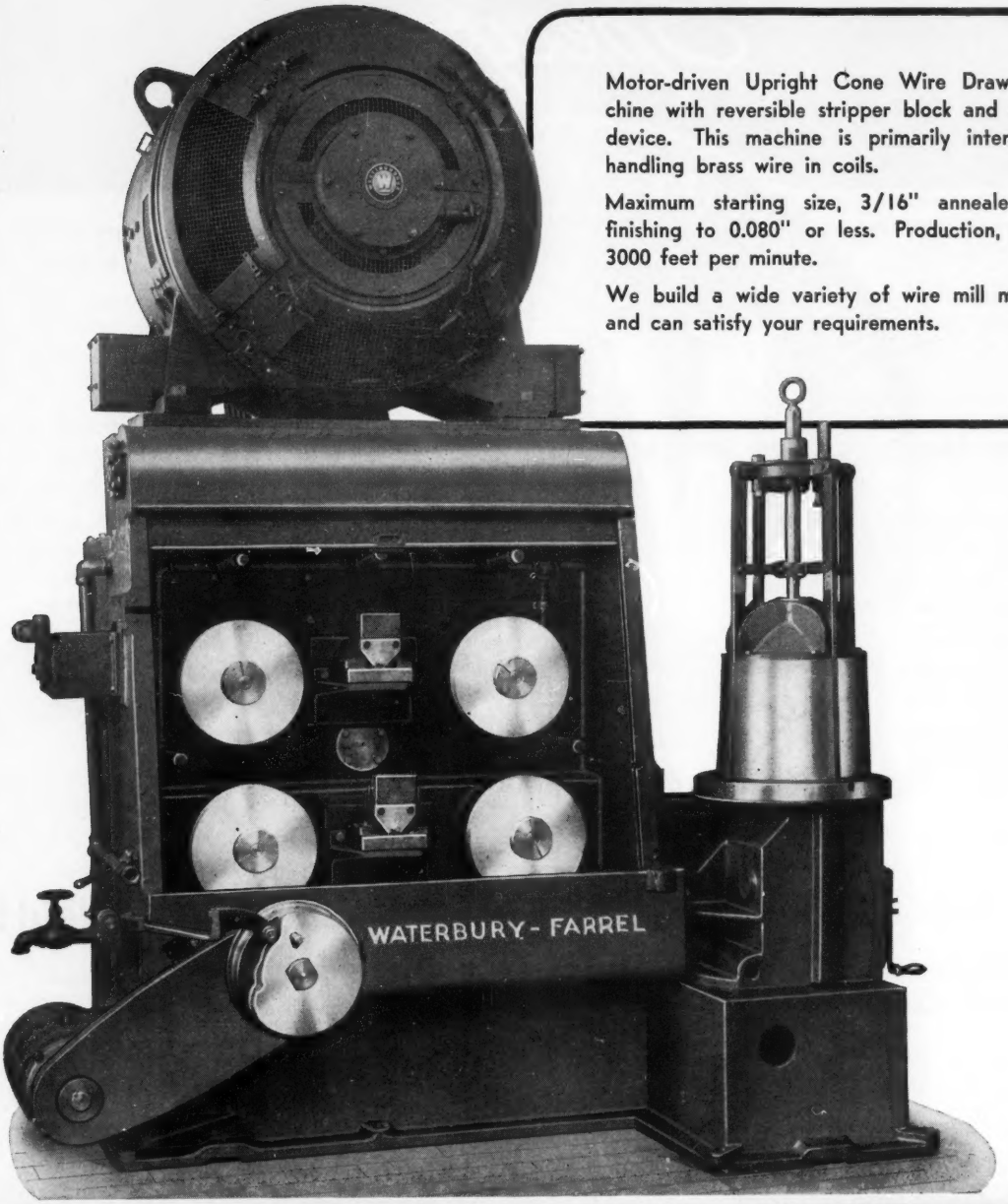

Motor-driven Upright Cone Wire Drawing Machine with reversible stripper block and string-up device. This machine is primarily intended for handling brass wire in coils.

Maximum starting size, 3/16" annealed brass, finishing to 0.080" or less. Production, 1000 to 3000 feet per minute.

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For the FINEST Dies...

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There Are Many Reasons Why V-R Leads The Field!

V-R NEW Cylindrical nib and improved method of assembly insure high degree of concentricity.

V-R . . . First in producing the only Tantalum-Tungsten carbide developed specifically for Drawing Dies.

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Vascoloy-Ramet CORPORATION

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The Wire Outlook

Downward pressures on business appear to have subsided and upward pressures are now gathering force, with promise of good business for the coming year.

The downward pressures felt in 1954 were mainly inventory adjustments and Government spending cuts. Three generating better conditions are rising industrial activity, increased individual spending and growing order backlogs. For several months now many factories are reported to have been receiving more orders than they have been able to fill.

Steel mill output rose to 81.5% in December, largely a result of big automobile production schedules, but large investments in new plants and machinery are also expected to have a sustaining effect on 1955's business.

One thing that will not be stable this year is wages. Labor leaders are counting on good business to provide the opportunity to force increases for workers in many lines and so their utterances have been becoming militant.

However, no run-away is anticipated, either in prices or wages. Cost of living indices should remain fairly stable, with a few ups and downs in various items. Spending for 1955, according to insurance economists, may reach $370 billions, which would be $5 billion above 1954 and $14 billion above 1953. This could make for better business, but will not result in a boom.

The stock market has topped previous bull-market levels in the last few months, because so many people have been buying on margin to get in on the rising prices. The Street looks for a technical adjustment of this condition, with stocks, however, closing higher at the end of the year, due to the better dividend outlook.

Employment should continue to rise. Hours worked will increase a little in addition to the slightly higher wages, so that there will be considerably more consumer money for goods and services. There should be no shortages of anything not involving strategic materials.

The wire rope business, built up to a point of high capacity during the last war, is getting back to more normal conditions. Manufacturers have felt the competition of imported rope, but by increasing their own efficiency and giving better customer service, the industry is facing 1955 with increased confidence.

A seasonal slackening in merchant wire products has been offset by a strengthening in industrial wire demand. New orders are being registered for valve spring and other specialty wires for the automotive industry and bookings are generally heavier except for tempered and fine wire specialties. Cold heading stock sales have improved with some indication that the first quarter will extend this trend.

Electric wire and cable producers are enjoying increased business and anticipate continued good business. The copper shortage had little effect on most concerns, because of stockpile releases and a cessation of stockpiling in the closing months of 1954.

The best advertised little recession of all time is now history. The country pulled through this touchy period very well, all things considered, and can now breathe more easily.

The business pick-up is starting on a firm foundation in this country and is being paralleled in Europe by an important recovery in England and on the continent. All this should make for a healthier two-way flow of exports and imports in the year ahead.

It is good to be optimistic, for pessimism tends to beget the very thing people would like to avoid, but optimism based on facts is good, sound business.

—from the Editor's Desk

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IMPROVED DIE LIFE

in the production of copper coated wire with

REDSKIN

Redskin Crystals are specially designed for the economical production of an adherent, uniform copper coating for both high- and low-carbon wire, *without the use of electric current, without the requirement of special equipment.* And there are no preparation difficulties . . . for Redskin is easier to handle, since it is a single chemical which dissolves instantaneously! What's more, Redskin gives improved die life at increased drawing speeds *without obnoxious dust!*

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WIRE
AND WIRE PRODUCTS

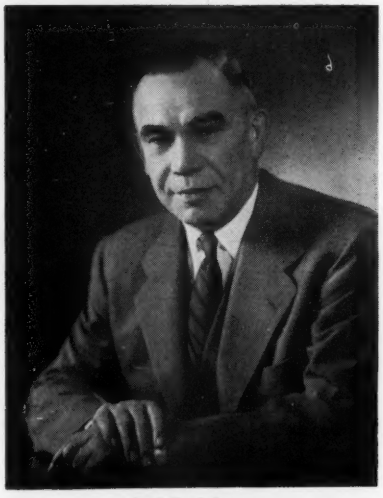
A monthly publication devoted to the production of Wire, Rod and Strip.
DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 30 JANUARY, 1955 No. 1

The Jack Mordica Story

by Carl E. Johnson
Superintendent, Rod and Wire Mills
Bethlehem Steel Company
Sparrows Point, Maryland

Each year at The Annual Convention of The Wire Association the Mordica Memorial Lecture is presented at the Annual Luncheon, which was held in Detroit, Michigan in 1954, on November 10th. On the person invited to present this Lecture is bestowed the highest honor that it is within the power of the Board of Directors to give to an Association member. Carl E. Johnson was so honored in 1954 and in his lecture he paid tribute to John Mordica, the Association's first president.
Carl is a native of Michigan and graduated in 1923 from the Michigan School of Mines with a degree of B.S. in Mining Engineering. That same year he started work for Bethlehem Steel Company as a looper. He was later transferred to the Open Hearth Department at Sparrows Point. In 1925 he went to the Rod and Wire Mill at Johnstown, preliminary to further work in the new wire mills under construction at Sparrows Point. When these mills opened in 1926 he returned to Maryland as John Mordica's assistant succeeding him as superintendent upon the death of the latter in 1937.



Carl E. Johnson

I wish to express my appreciation to the Board of Directors of **The Wire Association** for the honor of being selected to deliver the Mordica Memorial Lecture at this, our 25th Anniversary.

★ ★ ★

The reason, I am told, for their selection was my close association with Mr. Mordica during the most productive period in his life when he was not only building one of the greatest wire mills in the world but was devoting much of his time to the formation and development of this association, the anniversary of which we are now celebrating. If this reason is valid it seems logical to devote this time to a discussion and brief resumé of the man who helped to make it all possible, the man we are honoring today—**John Mordica.**

The Wire Association has made great strides since the early days of the "Mordica Administration." Its membership has greatly increased and service through the medium of papers, research, exchange of ideas, regional meetings and conventions has kept pace with the ever-increasing demands of its members. **The Wire Association** has grown up and is filling an important niche as a technical society among other outstanding technical societies the world over. This was all a dream twenty-five years ago and I believe it would be in order to pay tribute at this time to those men of vision who, together with Mr. Mordica, helped lay the cornerstone for this great organization—to **Ken Lewis** and **George Hartley,** who, together with **Dick Brown,** founded the organization; and to **Herbert Horsfall** and **Dwight Granger,** who served as vice-presidents during the first administration; and to the many others who attended and participated in that first organization meeting in June 1930. And I believe it is proper that we should pay special tribute to Dick Brown who has continued as General Secretary throughout this period and is largely responsible for the continuing progress and growth of the Association through his untiring efforts to promote its specific purpose "to improve production meth-

IN MEMORIAM

JOHN MORDICA
1873-1937

ods, afford a clearing house for ideas on management problems, technical problems, research work in all phases of practical wire drawing and wire working and to develop and maintain friendly relations among the members." The justification for **The Wire Association** is probably best evidenced by not only the growth of the Association but by the expansion and improvements in the wire industry during the past twenty-five years since that day when **Jack Mordica** rapped the gavel and stated, "I am both proud and grateful to have been accorded the distinction and honor of being the first President of **The Wire Association.**"

★ ★ ★

But to me the "Mordica Story" is more than just a narrative relating the sequence of events leading up to the formation and development of a wire association or the building of a wire mill. It is rather the characterization of a man with ideals and vision who could foresee the need for an organization such as this and who had the qualifications, the desire and the ambition to plan for and build a better wire mill than had ever been built before.

★ ★ ★

Jack Mordica came to **Bethlehem Steel Company's** Sparrows Point Plant in 1925 to help engineer, build, and operate a new wire mill. He came well recommended, having had charge of the wire operations in the Company's Johnstown Plant and having drawn wire in most wire mills in the country, with experience on all types and kinds of wire. His practical knowledge of the wire industry and many of its associated activities was vast, but he realized the magnitude of his new undertaking and he also recognized his own weaknesses and shortcomings. He welcomed assistance and advice from those in supporting branches of the operation such as chemistry, metallurgy and other engineering fields and in return he was always willing and anxious to impart his knowledge of wire to those who sought it. He studied and kept up a continual search for new and improved processes and equipment and always maintained an open-door policy for everyone who came to him for help. Probably among Jack's greatest characteristics was his generosity and his willingness to help others. Not only can I feel grateful for this characteristic, as well may others in this audience today, but it may have been this trait that helped establish and encourage the policy in the Association of improving the relationship among its members by helping break down the barriers between Plants and Companies through a more open discussion and freer exchange of ideas on those "secret" processes that seemed to exist in the earlier days of the industry.

★ ★ ★

So, while there may be a few old timers who had known Jack longer and some few who knew him more intimately, I believe they all agree with me that the "Mordica Story," as we all know it, could serve well as an inspiration to members of this organization and those who are just beginning their climb to industrial fame.

★ ★ ★

Like Joseph's coat, **Jack Mordica** was a man of many colors and like a faceted stone he sparkled from every angle. He was respected by everyone who knew him; he always played the game square. He was a home loving family man, he liked people, he loved to travel, he was a super salesman, he enjoyed books and good music, but above all he was a wire maker and he loved his job. He was considerate and understanding of the feelings of others, he was modest regarding his own capabilities. He was quiet and even tempered when things were right, yet he could fight at the drop of the hat if things went wrong. We can remember Jack in many different roles and poses with experiences probably not too different from our own. We can see him at his desk deeply involved with letters or a problem, scratching his bald head with his fountain pen contemplating the idea that some day he might write a book. Or we can see him getting ready to make a trip, snappily and flawlessly dressed or on his return showing signs of fatigue, carefully washing his celluloid collar, or with his face covered with patches of tissue after a quick shave with a borrowed razor. We have seen him jubilant over the result of his trip and angered over losing his new straw hat or having his shoes switched by an irresponsible train porter. We can remember Jack on the golf course in a drenching rain with the water filtering through a pack of Mail Pouch in his hip pocket and we recall when he had to give up this enjoyment in favor of cigarettes because of trouble with his upper plate. Jack was a character — he was regular — it is unfortunate that more of you didn't know him.

★ ★ ★

Too many people today remember Jack only by the profile picture that is reproduced each year in the January issue of Wire and Wire Products in connection with this program. Few people understand the significance of the profile. That story goes back a long way and probably marks the beginning of his wire mill career. He had started work in New Castle, Pennsylvania, but had moved shortly thereafter to Anderson, Indiana, where he was employed as a plate setter and die reamer. It was while forging a reamer that a chip broke off, piercing his left eye and causing permanent loss of vision in that eye. His road to success was not to be an easy one and while the loss of vision in one eye failed to deter his progress he was sensitive and few people ever became aware of his loss. The few portraits he had made were of the right profile with which you are familiar.

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The story of Jack's progress throughout his early career leading up to his coming to Sparrows Point has been well covered by many of the old timers on occasions such as this, and while it is not our purpose to discuss the building of a wire mill in Sparrows Point nor to expound on the merits thereof, still Jack and his mill were so much one and the same that it will be impossible in some instances to mention one without the other. And furthermore, our most intimate knowledge of Jack resulted

from seeing him in action, solving problems or creating problems for others to solve.

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The building of a wire mill in Sparrows Point had been a major step, the result of considerable thought and deliberation. The arranging and planning for the starting up of a wire operation in a plant theretofore unfamiliar with all the ramifications, stipulations and specifications contingent with the production of wire was an even greater one. It was a job for a master craftsman and **Jack Mordica** was that man. Jack probably knew what was ahead, probably anticipated the troubles and problems that might be encountered when, as Lou Winkler stated, it took considerable persuasion to convince him that he was the man for the job. It was fortunate for us, for the industry as a whole and for the Wire Association, that he made his decision, because from that decision emerged the Dean of the Wire Industry.

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The early construction days were busy ones for Jack. He was not only busy in the Engineering Department selecting and arranging the best in equipment and layout but his was the responsibility for selection of an organization capable of taking over when the mill went into operation. He selected his men with care, men whom he could trust and in whom he could place responsibility. For his was the policy of delegating to each department head the full responsibility of his department. He was to act as advisor and guide, but without interference. If they did a good job they got the credit, if they made a mistake he took the blame. As the word spread of a wire mill starting in Sparrows Point others came — mill men, wire drawers, nail operators, blockers and reelers. Many were floaters but they liked the mill and they liked **Jack Mordica** and many of them stayed, many are still with us today.

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Jack Mordica had a way with men. They respected him for his ability and knowledge of wire, they loved him for his down-to-earth human approach. He was always willing to help anyone in trouble and would go out of his way to keep anyone out of trouble. His refusal to prosecute the mill laborer who had wrecked his car, his willingness to give a workman guilty of misdemeanor another chance, extending credit or cancelling a debt or helping out with the rent or sending some youngster to school were typical of Jack. They were the kind of things that were helping to build loyalty into his organization, so necessary for a successful operation. They were consistent with Jack's philosophy of life by which he lived and worked to "live and let live."

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As the "House that Jack Built" was taking shape we were beginning to see another angle or facet in Jack that sparkled just as brightly as others we had noted. It was a brighter hue than the more sombre tones evident when he was seriously engaged in putting the first billet through the rod mill or when arguing with the steel plant for a special grade of steel to make a certain type of wire. Jack, we were beginning to discover, could mix pleasure with his work, he could have his fun where he found it. And as we were to learn from his own stories and yarns of his early days, this was not a newly acquired trait. He often talked about the good old days when the wire drawers knocked off for a couple months during the summer, packed up their families and provisions and headed for the banks of the Wabash for a summer's vacation. And for years after coming to Sparrows Point we found him heading back to the mountains of Pennsylvania with his family for week ends and vacations. Jack loved life, got a lot out of it and also contributed his full share. At any gathering of friends, whether at home or away, you'd find Jack the center of attraction. Jack was an actor, a real performer and before any party was far under way you might find him doing a take-off on the "Hunchback of Notre Dame" or dancing a sailor's hornpipe or Highland Fling. But as usual his work came first and every day you would find him in the mill, dipping his finger in the acid tub and tasting it to test the acid strength or twisting a piece of wire for knot strength or zinc adherence.

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He was the typical wire man of the old school but open minded enough to see the new era in wire looming on the horizon. Wire was fast coming into its own, no longer the step child of the steel plant designed chiefly to use the cast-offs — the discards from other sections of the plant. The "hay wire" days were fast disappearing, for even such things as baling wire were beginning to find their way into the specification column. The years ahead were destined to be busy ones, years of continual change, changes and improvements in equipment and processes with corresponding improvements in quality of product and efficiency of operation. Jack was ready to meet the challenge.

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The rod mill rolled its first rods in March 1926. The first wire was drawn shortly thereafter and other finishing units followed in quick succession. Each department was equipped with the best and most up-to-date equipment available at the time. Nothing had been spared either in the quality or quantity of the producing and auxiliary facilities, with ample room provided for efficient operation and smooth flow of material from one section to another. But like the housewife who starts rearranging her living room furniture a week after moving into a new house, it wasn't long before Jack was beginning to feel the urge — the urge for rearrangement, the need for additions and improvements to his new "house."

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Those of you who knew Jack are familiar with what he thought of the cleaning house. He continually emphasized the importance of good pickling, and, as many of you agree, that **there** was the heart of the wire mill. For this reason special attention had been given to this particular section of the mill. Two high-speed roller bearing steam cranes, a circle of wood pickling and wash tubs with a straight line power driven continuous sull rack, lime tubs and oven bakers com-

prised the equipment of this, the most essential part of the mill. This was to be the first to be put under the hammer. Late in 1928, two years after the mill had gone into operation, negotiations were begun for a new straight line cleaning house. Engineering work on the new project started in 1929 and in October 1930 the new line went into operation. This same unit, since equipped with flash bakers, is still in operation together with two other units of similar construction.

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Together with the celebration of the 25th Anniversary of the Wire Association we might well be celebrating the anniversary marking the beginning of the revolution in the wire industry. And Jack Mordica was having a hand in the "tea parties" helping to lay the ground work which was to break the shackles from some of those old time-worn ideas that had persisted in the generations of the past.

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The story of the tungsten carbide die parallels that of straight-line cleaning. It was in 1926 when we heard the first rumbling of a new magic metal which was destined to play an important role in the years ahead. It was not until 1928, however, that tungsten carbide, then known as "Krupp metal," appeared on the market for the first time. Here again we find Jack Mordica ready and willing to grab the bait that juicy morsel which eventually was to change the entire pattern in wire drawing practice. For in November of that same year Jack had received and had begun a test run on tungsten carbide dies. In July 1931 tests had been completed and servicing equipment was installed and by 1934 the entire mill was completely equipped with the new dies.

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These are typical examples of our adventures with Jack Mordica. Not only a case of keeping up with the Jones family but more often than not being Mr. Jones himself. The mill had started up entirely on low carbon, but in 1930 the first patenting furnace was installed and we were in the spring wire business. And as many of you probably know, we have been in the high carbon business ever since. It has also been stated that the general quality of spring wire throughout the industry improved as a result of the standards that **Jack Mordica** set up for himself. Additional furnaces followed and spring wire came to be one of the major products of the mill. Other changes followed in rapid succession. The size billet was increased to produce larger coil size, double deck blocks were installed as early as 1929, electric trucks were beginning to appear to improve material handling, the old coal fired annealing pots had given way to the new gas fired radiant tube furnaces and at last the appearance of the modern continuous wire drawing machine made possible by the tungsten carbide die, which was eventually to replace all of the single blocks used for multiple hole work. All these and many more were the accomplishments of Jack Mordica. Jack had brought wire to Sparrows Point, to a steel plant where a few years before wire had been unknown.

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Despite this solo flight into a new and unexplored area in which we have tried to portray Jack, we must admit he was not altogether alone in the new enterprise — he did have a co-pilot. Jack, the practical wire man, had long realized the importance of metallurgy in the manufacture of wire. Whether it was a case of sympathetic reciprocity that caused Lou Winkler to bring Jack to Sparrows Point we do not know; we do know that Jack didn't hesitate very long before he signed Lou up as a member of his team. Lou Winkler's long experience in the metallurgy of steel in a plant long devoted to the manufacture of wire proved to be invaluable in the starting up of the plant and in the subsequent development of new products. The mutual respect that each had for the other's knowledge and ability served well in solving the never ending problems present in any new operation. What **Lou Winkler** thought of Jack could probably best be summarized by Lou's own statement:

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"One of Jack's characteristics which distinguished him from many of his contemporaries was that while his training and attitude was that of a practical craftsman, he was most sympathetic to what in those days might have been termed a scientific approach; for example, a wider application of metallurgy to this important commodity known as wire. In fact, he was always anxious to get as much information as would be available, that would in any way help or improve the production of the wire industry. This attitude on his part, in fact, was at distinct variance with the attitude that many of the old timers of the wire industry exhibited. Thus I am sure that the ties that bound Jack and me together were his interest in metallurgy and my interest in the craftsmanship as applied to the manufacture of wire. As a consequence, there were many opportunities that both of us sought for very serious bull sessions. I think that the outstanding feature of Jack's personality and his active mind was the ease with which he could assimilate the metallurgy of cold-worked steel, and his open mindedness and willingness to apply the more or less undeveloped philosophy of that day to practical production methods."

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There is no doubt but what this close relationship resulting in a progressive cooperative research program directed toward the breaking down of many of the antiquated conceptions regarding the drawing of wire, involving speeds, coatings, lubricants and efficiency of operation helped not only Jack in his own operation but contributed much to the advance of the wire drawing industry as a whole.

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There is still another avenue in which we are to find Jack, an avenue of achievement even surpassing anything we have yet seen. One can well imagine the big problem confronting Jack in the late 20's and early 30's with a new mill, added capacity in a new territory with old established suppliers and a depression setting in. It wasn't enough that he should have provided the best in facilities and a good organization, he must now go out and find a market for his product. This he did. He spent much of his time on the road, learning the markets, meeting customers, making new friends and lastly and most important of all — developing good will. A keg of nails or a ton of wire was of secondary consideration; gaining the respect and confidence of the people he visited was his prime concern. As our sales

(*Please turn to page* 114)

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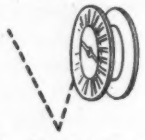

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Symposium on Wire Drawing Lubricants

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Philadelphia, Pennsylvania

PANEL MEMBERS

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Technical Director
Standard Industrial Compounds Co.
Chicago, Ill.

Leon Salz
Mgr. Lubricants Div.
Magnus Chemical Co., Inc.
Garwood, N. J.

Jerome B. Bean
Wire Lubricants Division
Apex Alkali Products Co.
Philadelphia, Pa.

This symposium was held at the opening joint session of the Ferrous and Non-Ferrous Divisions of The Wire Association in Detroit on Monday afternoon of November 8, 1954. The papers of the three panel members, together with the discussions that followed are presented here in full.

Wire Drawing Lubrication

by Grey Verner, Technical Director
Standard Industrial Compounds Company
Chicago, Illinois

I. Introduction

In any panel discussion or symposium the chief benefit is generally derived during the open-forum period following the formal presentations. Those of us who work for lubricant manufacturers look forward to these sessions just as eagerly as you wire men do and for pretty much the same reasons.

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Presumably you come here in the hope that you will go home with some clue to the solution to your most pressing lubrication problem. We come here to learn what these problems are and many times as the result of the discussion, to decide on the best approach to the solution to your problems.

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It was Plato, I think, who said, "A problem properly defined is a problem half solved." Many times the wire man suggests the solution to his own problems when he talks them over with his friends. That is what we hope to accomplish here. As a means toward accomplishing that end, let's consider the various factors in wire-drawing which affect the choice of a lubricant.

II. Factors in Wire-Drawing Affecting the Choice of a Lubricant

There are a number of major factors which enter into the selection of a wire-drawing lubricant. Each of these factors, in turn, has certain ramifications which must be considered.

A. The Metal Being Drawn

There are present today members of both the Ferrous and Non-Ferrous sections of The Wire Association. This division of the Association suggests the first variable—are we dealing with ferrous or non-ferrous metals?

1. Non-Ferrous Metals

Most of the problems encountered in the drawing of non-ferrous metals are similar to the problems of drawing ferrous metals which will be discussed below. It should be emphasized, however, that non-ferrous metals sometime receive quite different treatment because of inherent characteristics of these metals and their alloys. This particular subject cannot be treated in a general way; rather it requires special attention by the lubricant manufacturer.

2. Ferrous Metals

Like the variation in brasses, low carbon steels usually require different drawing practice from high carbon. As the composition proceeds through alloys and stainless steels the problems increase in almost geometric proportion.

B. The Surface Condition of the Rod or Wire

To simplify the discussion it will be assumed that the rod or wire is in a drawable condition. That is, it is round with relatively few surface imperfections and that it has

the proper physical structure and chemical composition. This assumption still leaves many variables to be considered.

1. Scale Removal

The importance of proper cleaning practices in the success of the wire-drawing operation cannot be overemphasized. The mill scale must be removed with a minimum of pitting action on the surface of the steel. Rinsing must be thorough to avoid accidental contamination of other pickle-house reagents.

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When mechanical descaling recently came into a position of relative importance, it was felt that this would introduce major differences in the chemical composition of the lubricant to be employed. Actually this did not prove to be the case. In those cases where mechanically descaled stock was drawn with some degree of success, the lubricants were not greatly different from those employed in the conventional drawing practice.

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The mechanical descaling operation has not reached the position of prominence originally predicted for it. There are several reasons for this. Sulfuric acid is no longer in short supply. The equipment for acid-pickling represents a considerable investment which cannot readily be discarded. Certain types of finishes were not readily achieved using wire which had been mechanically descaled. This is an inherent characteristic of the process.

2. Coatings Employed

On acid-cleaned material the type of coating which is used plays an important role. The use of lime in wire drawing has been the subject of several papers. Practically every wire man has his own idea as to the liming practice which should be employed — the type and grade of lime, method of preparing the suspension, the concentration, the temperature, drying or baking procedure, prior treatment of the wire, etc. The type and thickness of lime coating so produced is a matter of definite concern to the lubricant supplier. The principal problem here lies in inconsistency in the quality and quantity of coating produced. For wide variations in the type of coating, it may be necessary to employ different lubricants for a particular drawing operation. A shift to a different type of coating (borax, for example) may also necessitate a change in the type of lubricant required. Here, again, variations in the coating itself may introduce problems.

3. Metallic Undercoatings

For certain products the wire manufacturer resorts to the use of metallic undercoatings. These materials function in a manner very similar to the chemical coatings mentioned above; that is, they provide a sleeve of a more ductile material over the base metal thereby enhancing the drawability. In addition to their functional use, they are also sometimes decorative.

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Fine wire is frequently processed with a copper, tin, or liquor-finish. Stainless wire may be lead-coated, copper-coated, oxide, or oxalate-coated. Frequently steel wire is galvanized. The sull coat is probably the oldest example of a metallic-type undercoating. Recently many manufacturers have investigated the practicability of employing phosphate coatings on steel wire in an effort to increase die life and reduce lubricant consumption.

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Using a similar line of reasoning lubricant manufacturers have recently been working with new additives to reduce the heat of friction and thereby enhance the possibility of more uniform "physicals" and greater speeds.

C. The Mechanics of the Drawing Operation

One of the principal responsibilities of the wire mill supervisor occurs when he must decide how a particular drawing operation should be carried out. He must select the drawing speed, the type of equipment, the reductions to be employed, the die-room practice and the lubricant to be used in such a way as to give the desired finish at a minimum over-all cost.

1. Speed of Drawing

There are probably as many different speeds of drawing as there are mills—perhaps more. The selection of the speed to be employed is tied in with the labor cost, die costs, equipment cost and lubricant cost. There is an additional factor which might be classed as a combination of pioneering spirit and personal satisfaction. Just as some people like to race sports cars, others like to draw at high speed. And, just as the sports racing enthusiast may be testing improvements on tomorrow's automobiles, so the advocate of high-speed operation may be developing the future techniques of wire drawing.

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Generally speaking, today's lubricants are rather versatile and are able to be used under a variety of operating conditions. However, it is conceivable that a lubricant which is completely satisfactory at 1200 fpm might prove inadequate if the speed on the same job were boosted to 2200 fpm.

2. Type of Equipment

The selection of the particular piece of equipment to be used is often a matter of convenience of scheduling; that is, the availability of a set of machines. However, there are occasions when the supervisor must decide whether he should use a dry powder, wet lubrication, or, perhaps, grease drawing. Then he must select the drawing machine best suited to the particular job. It may be necessary to modify the equipment to use a combination of types of lubrication. In such cases each mill's problems must be treated individually.

3. Reductions Employed

In general, the reductions employed for any given wire-drawing job are fairly well standardized. Occasionally, though, a job will come along which should be done in 7-drafts which will be carried out in six—or maybe even five. Such a practice may call for a modified lubricant.

4. Die-Room Practice

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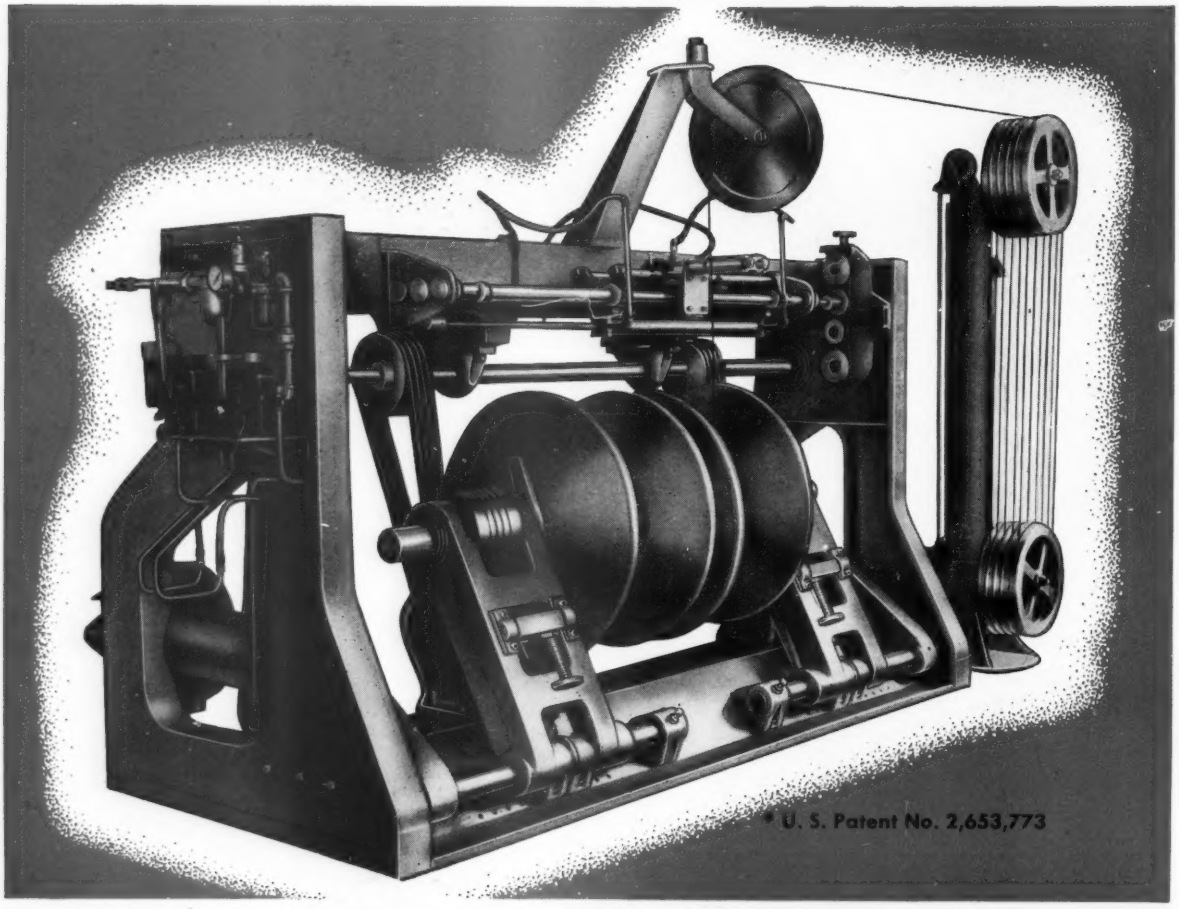

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provides much of the "know-how" necessary for successful operation of the wire mill. Some of the factors which he must consider include the selection of the proper die from the stand-point of nib-size and hardness, the die angles which are to be used (both entrance and relief), and the length of bearing which is to be employed. In special instances the shape and size of the bell of the die have proven to be extremely important.

5. Lubricant Selection

Selection of the proper lubricant is mostly a matter of experience. Knowledge of lubricants which have served successfully in similar problems indicates the probable lubricants to be tried. Particularly knotty problems may require the cooperation of the lubricant technician.

D. The End Use of the Wire

The foregoing considerations have all dealt with the process of drawing wire as such. Just as important as drawing the wire itself is the matter of producing a wire which satisfies the needs of the customer. Frequently the end use of the wire is the most important single factor in the selection of a lubricant.

1. Physical Characteristics of the Wire

Frequently the specifications on a finished wire are to be held within very close tolerances. The desired characteristics can be achieved only through the use of a very rigorous procedure involving, for example, a series of very severe reductions. On such occasions it may be necessary to carry out an extensive research program in order to find the lubricant which will produce the desired results.

2. Appearance of the Wire

As steel has become more plentiful and salesmanship has begun to replace order-taking, the finish on the wire has become increasingly more important. People who were formerly satisfied with wire—any wire—are now beginning to look at their purchase, frequently with a magnifying glass or microscope.

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With this increased emphasis on appearance, lubrication has assumed an even more important role. The lubricant manufacturer has, in turn, been forced to re-examine the quality and versatility of his products.

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Recently there have even been requests for lubricants in color. Although this problem was solved technically through the incorporation of pigments during the manufacturing process, it was an impractical solution because of the high cost of the pigmenting materials.

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A logical outgrowth of this work with pigments was the development of a plastic paint—a versatile product which is tough, adherent, colorful, corrosion-resistant, and relatively inexpensive.

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Considerable interest has recently been shown in the field of copper-coated wire. Improvements have been observed in applying the copper-coat, improving the resistance to tarnish, and producing a brighter finish during and after the drawing operation.

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In another area, nail finishes have received considerable attention with the development of several satisfactory lubricants for this purpose.

3. Factors Involved in Further Processing

There are occasions when a lubricant will do the prescribed drawing operation in a mechanically-perfect manner and still be unsatisfactory. A few typical examples will serve to illustrate this point.

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It may be necessary to change the lubrication practice in the production of wire for welded fabric because the coating of lubricant remaining on the wire interferes with the subsequent welding operation.

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The coating remaining on nail stock may be too gummy and tend to fill the nail-gripper dies or prohibit cutting, even though the wire drew perfectly.

In another instance, the coating remaining on the wire may be so adherent that it is not readily removable in subsequent cleaning operations so that electroplating may not adhere properly.

4. Subsequent Forming and Deforming Operations

The foregoing examples were instances where too much lubricant remained on the wire. In other cases, just the reverse may be true.

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For example, the bolt maker requires that a coating of lubricant remain on his wire (rod) for use in the subsequent heading operations. In this case the coating must have exactly the right characteristics. It must be hard and dry enough to provide lubrication for the heading operation and, at the same time, there must be enough coating to lubricate but not fill the header dies. That is, it must be slick enough to slide in and out of the die, but not so slick as to produce crooked or ill-shaped heads.

III. How the Foregoing Factors Affect the Choice of a Lubricant

Probably the most important factor from the standpoint of lubrication lies in the amount of heat which is developed in the drawing operation.

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The metal being drawn has an effect on the temperature which is developed in the drawing operation. Copper, for example, is generally considered to be more ductile than steel. High- and low-carbon steels may have different heats of deformation, with alloys and stainless again being different. The effects are, to a certain extent, compensated for in the drawing operation by a variation in the drawing speeds, reductions, etc.

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The designers of the drawing equipment have recognized the importance of this heat effect and have employed ingenious methods for its removal. The amount of heat generated is, of course, very nearly directly proportional to the speed of drafting. It seems probable that

the amount of heat generated is directly proportional to the reduction in cross-sectional area. It is likely that the amount of heat produced is affected by the die angles only to the extent that the change in die angle affects the heat of friction.

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The over-all net effect of the foregoing heat factors, that is, the heat of reduction plus the heat of friction minus the heat dissipated by conduction and radiation, gives the temperature of the drawing operation. This, in turn, establishes one of the most important factors in the selection of the wire-drawing lubricant, i.e. its melting range which is commonly described as its "richness." The melting range is that range of temperatures over which the lubricant functions satisfactorily.

IV. A Simple Theory of Lubrication

A lubricant serves to reduce friction and minimize metal-to-metal contact. The process is very similar to a roller-bearing which accomplishes its purpose in two ways:

(1) by providing a separator which keeps the sliding surfaces from touching each other.

(2) by providing an adherent "greasy" component which gives slipperiness (lubricity) to the sliding surfaces, thus reducing the friction.

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In wire-drawing lubrication the separation may be provided in a number of ways:

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1. **Lime or borax coating on the rod or wire.**
2. **Copper (or other metallic) coatings.**
3. **Phosphate coating.**
4. **The high-melting components used in the manufacture of the lubricants. For example, lime, alkalies, pigments, metals, metallic compounds, etc.**

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The lubricity is provided by any or all of the following components:

1. **Mineral oils and greases.**
2. **Waxes.**
3. **Fats and their derivatives.**
4. **Extreme pressure additives.**
5. **Synthetic chemicals — silicones, plastics, etc.**

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To produce an efficient wire-drawing lubricant a combination of all or part of the foregoing components must be used in such proportions as to provide a mixture which flows (provides lubrication) in the temperature range that is generated by the wire-drawing operation.

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The ideal wire-drawing lubricant would be one which would function under all conditions of temperatures and with all types of cleaning-house coatings. In actual practice this has not been achieved. As better separators are incorporated with more efficient fats and oils, the resultant lubricants have wider melting ranges. Balanced against this improvement in performance is an increased cost or raw materials and the added expense of the refinement of the manufacturing process. It becomes a matter of economics, therefore, either to buy a lubricant patterned especially for the job or to employ a general purpose lubricant designed for several different uses.

V. The All-Important Problem of Finish

In the early days of wire-drawing the principal problem was one of drawing the wire. As the science has improved, drawability has come to be taken for granted and the role of finishes has become more and more important.

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The summer just past was extremely hot and humid. Conditions were ideal for the formation of rust. Suddenly practically everyone in the wire industry was plagued with the problem of extra-clean extra-bright finishes and how to maintain them. This is not an easy problem to solve because of the inherent nature of extra-clean extra-bright wire — under ideal conditions the finished wire has no coating left on it and therefore no protection from rusting.

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This is one of the fields in which the lubricant researcher is currently concentrating his efforts. It is important that the wire man recognize the important role he plays in the solution of problems like this. He is actually a very important member of the research team.

If the usual procedure in the development of a new wire-drawing lubricant is outlined, it will demonstrate the importance of continued cooperation between wire-men and lubricant manufacturers.

1. Definition of the problem—An important part of lubricant research which is too often overlooked. There can be no improvements in wire-drawing lubricants without a clear-cut definition of the desired results. This is definitely a function of the wire-drawing supervisor.

2. Development of a series of lubricants which are felt to have possibility in solving the problem. This is a function of the lubrication research man working in conjunction with the wire man. The lubrication engineer provides the background of years of experience in solving similar problems and the manufacturing "know how" of solving the lubricant production problems. Often, however, the key idea will come from the wire man.

3. Testing and systematic elimination of the poorer choices by trial and error in the mill. The lubrication engineer can make physical and chemical tests on the quality of raw materials and finished products. In the final analysis the key test is provided by the wire man—"Will it draw the wire and produce the desired finish?"

4. Selection of the BEST lubricant for the job. Here again is a decision to be made by the wire man, possibly aided in reaching his decision by the desires of the customer. In making his decision the wire man is often guided by the time-worn expression—"THE BEST IS CHEAPEST IN THE LONG RUN."

5. Manufacture of this "best lubricant" on a production basis. Here the lubricant maker is on his own. However, close cooperation between manufacturer and consumer during development is continued to insure consistently maintained quality.

VI. Conclusion

The value of symposiums like this one does not lie in the rehashing of old techniques. Rather it is in the opportunity for us to get together to consider new problems and examine methods of applying previous experience to their solution.

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Wire mill men and lubricant workers are both researchers at heart. This is a happy combination which gets results. If necessary, they will work together for days and try literally hundreds of lubricant combinations in their desire to accomplish a given reduction or achieve a special finish. When the job is finished, they both feel like the fisherman who has hooked a twelve-pound bass—it was well worth the time spent.

Dry Drawing Lubrication in the Wire Industry

by Leon Salz, Manager,
Lubricants Division
Magnus Chemical Co., Inc.
Garwood, New Jersey

During the last four years I have had the privilege of visiting over 150 wire mills across the country, including most of the major ferrous mills. My contacts on these visits were with plant superintendents, metallurgists, foremen and others vitally concerned with the quality and efficiency of wire production. I have found that wire mill operating personnel readily appreciate the importance of proper lubricant selection. They have learned from trial and error experience that the use of the proper lubricant allows for faster drawing speeds, longer uninterrupted production, better looking wire and maximum life of expensive dies.

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Nevertheless, it is frequently acknowledged that they are not as familiar with the details of lubricant manufacture and selection as they are with the mechanics of wire drawing. Wire mill operating personnel rely heavily on the judgement of the lubricant vender and pass on the appropriateness of his selection on the basis of plant tests. As a representative of a wire drawing lubricant supplier, I would like to review the subject of wire drawing lubrication, with special emphasis on dry process drawing, so that those less familiar with this specialized field will have a better understanding of the type products available and their respective applications.

Methods of Wire Drawing Lubrication

Wire drawing is performed by either a "dry" or "wet" method of lubrication. The distinction between these two methods lies in whether a solid or liquid lubricant respectively is employed.

In the dry method, the rod or wire is generally pickled, washed and in the case of ferrous metals, coated with an alkaline material, such as lime. The coating material serves as a bond for picking up the dry drawing soap and, secondly, to provide rust protection during storage. The dry drawing lubricant used may be a granulated soap, grease or paste compound, which is placed in a box of 1 to 5 lb. capacity immediately ahead of the die. The wire passes through the box, picks up the lubricant, and then enters the die.

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Dry drawing may be used either in connection with single hole block drawing machines or in multi-die continuous drawing machines, wherein the wire is given a number of successive reductions in the same frame. The use of dry process drawing is common practice on all ferrous wire larger than approximately .035″ diameter (20 gauge) and is frequently used in non-ferrous wire drawing in the first die singularly located outside the machine.

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Wet drawing is employed for finer sizes of ferrous wire and for most non-ferrous wire. The process is conducted on continuous wire drawing machines wherein the lubricant is circulated over the dies, wire and blocks, to afford cooling as well as to reduce friction. Aqueous soap-fat solutions or emulsions are commonly used for carbon steel, copper and brass wire drawing by the wet process. Compounded oils are used ordinarily in drawing aluminum wire and stainless steel.

Factors Affecting Lubricant Performance

In the selection of a suitable lubricant for a given set of service conditions, a number of factors must be considered:

1. Type of Metal

Wire of different metals vary considerably in their drawability. Metals with poor ductility and those which work-harden easily are most difficult to draw. In general, among the more common metals, "stainless" gives the most trouble, followed in order of decreasing difficulty by high carbon steel, low carbon steel, brass, aluminum and copper.

2. Metallurgical Condition of Rod

The processing of rod in the course of manufacture has an important influence on its drawability. A highly ductile and tenacious material is most desirable. Ductility, which is the capacity of a metal to undergo plastic deformation under pressure, is related to the crystal (or grain) size of the metallic structure. For a given metal, greater ductility and correspondingly superior drawability are associated with a larger "average grain size". Metal is often annealed to order to increase the grain size and, thereby, enhance the drawability.

3. Physical Condition of Rod

It goes without saying that the surface of the rod should be free of scale, corrosion and dirt for successful drawing. This is generally accomplished by acid pickling, followed by a water rinse, and the application of an alkaline rust-proofing treatment in the case of steel. Considerable attention is being given the use of mechanical descalers to supplant the removal of scale by acid pickling, but this very attractive alternative has not yet been developed to a point of general acceptance.

4. Mechanics of the Operation

Under the term "mechanics" are included the speed of drawing, gauge of wire, percent reduction and efficiency of the die. More efficient lubricants are required for higher speeds, wider wire diameters and greater reductions because of the corresponding increase in heat from metallic deformation and friction.

The materials of construction in the manufacture of the die are of primary importance in determining the limitations in drawing speed and percent reduction. For example, carbide dies used in dry drawing will allow for more efficient conditions of operation than iron dies. The use of water cooled dies are helpful in that they assist in the dissipation of heat and allow for faster wire travel and greater uniformity of the finished product. For wet drawing of fine wire, diamond dies are best.

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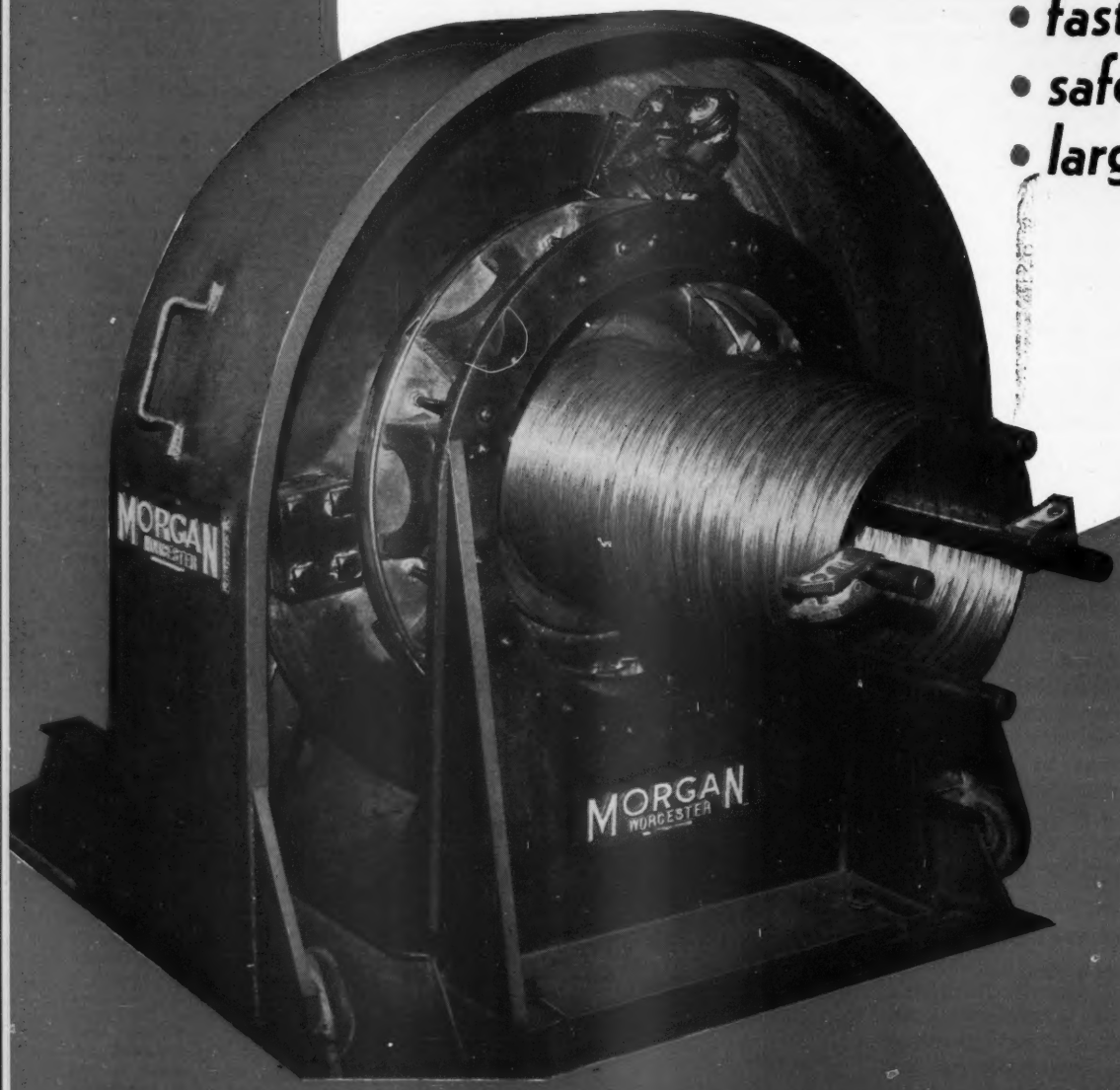

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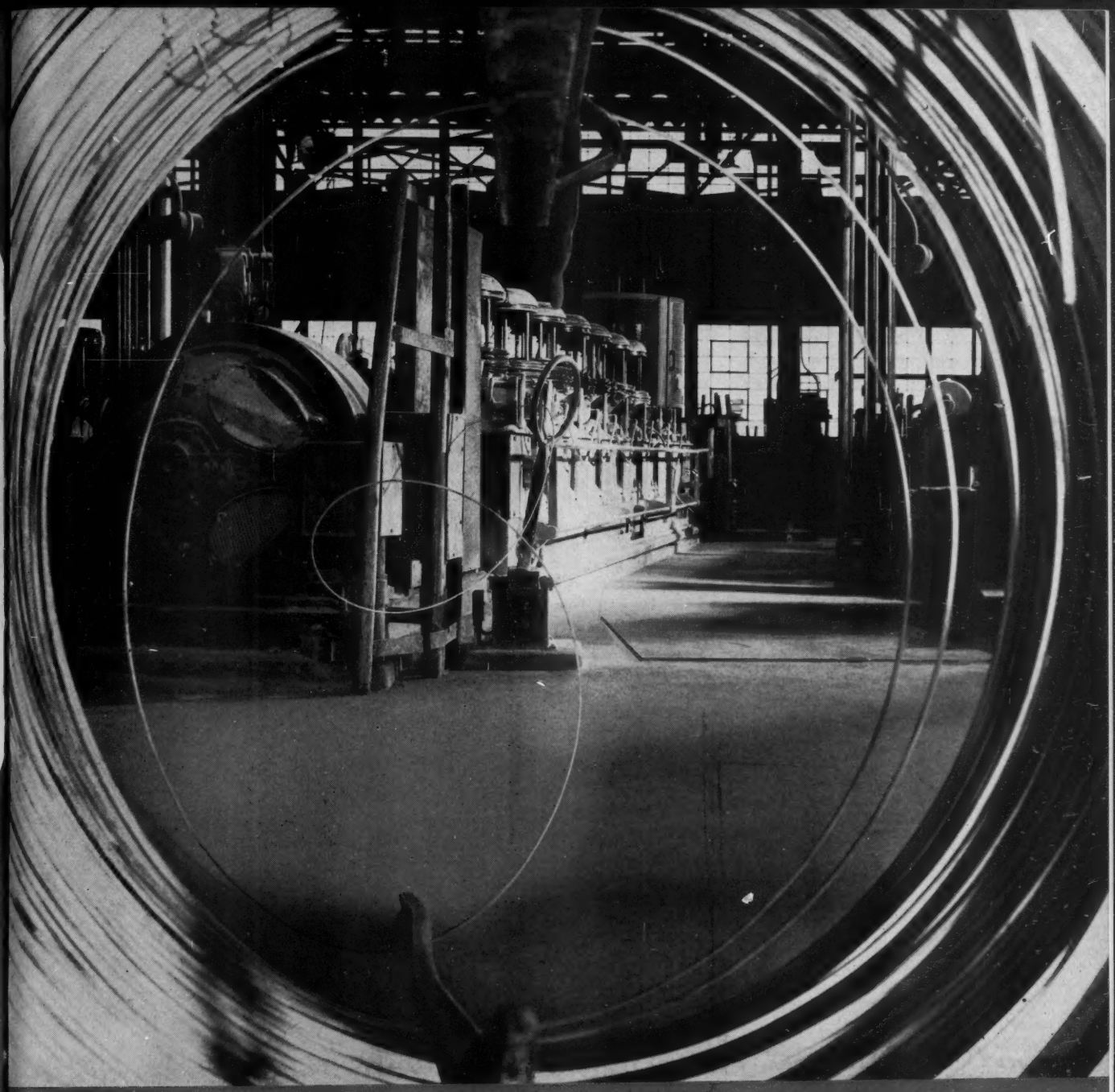

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WIRE MACHINES

WM-89

How Do Wire Drawing Lubricants Function?

The purpose of a wire drawing lubricant is to provide an extensible film between the work and die capable of permitting rapid elongation of the wire under pressure with a minimum of die wear, while giving the type wire finish desired.

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When work-die pressures are low, dilute soap solutions, general purpose soluble oil or straight mineral oil can give satisfactory service because the pressure is not great enough to rupture the lubricating film. As pressures become greater, compounds containing sufficient "oiliness" (polar) materials such as fats and dry soaps are required. These materials are absorbed to metal surfaces, maintaining a persistent thin film where lubricants lacking sufficient oiliness would be squeezed out, resulting in welding and seizure. These latter conditions are evidenced by metallic "build-up" on the die, the direct cause of scratch marks on the work.

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In some cases "extreme pressure" materials are added to a wire drawing compound to minimize welding and seizure. The extreme pressure agents available function either by chemical or mechanical methods. Those materials that provide extreme pressure characteristics by a chemical method usually contain sulphur or chlorine which react with the work and die to form protective metallic surfaces highly resistant to welding and seizure. Compounds that function mechanically minimize friction by the incorporation of powdered spacing agents (pigments) such as lime, or chalk in the drawing compound, these substances acting as separators between the work and die.

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The ideal drawing lubricant for use under a given set of operating conditions is the one which permits the desired draw with a minimum of build-up on the die from the drawn metal, gives the greatest poundage of wire within the established gauge tolerance, and does the job in the most economical manner.

Dry Drawing Lubricants

The wire drawing lubricants commonly used may be divided into six categories—dry granulated soaps, petroleum greases, soap-fat paste compositions, compounded mineral oils, soluble oils, and graphite compositions. Inasmuch as this paper is concerned primarily with dry process lubrication, only the solid lubricants will be discussed.

1. Granulated Soaps

These materials are the most common type of dry drawing lubricants. With the exception of drawing extra-clean, extra-bright finish wire, granulated soaps are employed almost to the exclusion of all other lubricants in the drawing of ferrous wire down to fine sizes (about 20 gauge). Three types of granulated soaps are commonly manufactured—sodium, calcium and aluminum. Potassium soaps are frequently employed in the wire industry, but the use of these materials is generally limited to wet drawing.

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Soaps are a class of materials that have a wide divergency of meaning to the laymen. In its basic conception, a soap is the reaction product of an alkali and a fatty acid. The characteristics of a soap are dependent upon (1) the type of alkali used, (2) the types of fatty acids with which the alkali is reacted, and (3) other materials present in the soap.

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Sodium and potassium soaps are water soluble whereas the calcium and aluminum soaps, often referred to as "metallic soaps," are water insoluble. Sodium hydroxide gives hard soaps and for that reason their principal use is in the manufacture of dry drawing lubricants. Potassium soaps are soft and are therefore most adaptable to the manufacture of wet drawing paste type lubricants which must readily dissolve in water. The metallic soaps have greater resistance to heat than the water soluble types and are therefore generally preferred for difficult dry drawing operations.

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The raw fatty material used in the manufacture of soaps may be either fatty oils, fats, or fatty acids. Soaps made from fatty material which have a minimum number of double bonds (largely saturated molecules), such as tallow or hydrogenated fish oil, give harder soaps with higher melting points than soaps made from corresponding unsaturated fatty materials. Where fatty oils and fats are used in the manufacture of soaps, glycerine will be a by-product of the reaction.

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The sodium soaps are prepared by chemically reacting fat, or fatty acid, with caustic soda or soda ash. The soap formed must be freed of the by-product, glycerine, if fat was the starting point. The soap is then dried, removing the water content so completely that it is practically anhydrous. The presence of only a small amount of water ruins a soap for dry drawing lubrication because it will "cake-up" in the box. As a final step in the manufacturing process, the dried soap is ground to a convenient particle size; too coarse can result in inadequate lubrication, whereas too fine can be objectionable from soap dust floating in the air and problems of wire tunneling.

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The metallic soaps are prepared by reacting water solutions of a metal salt with sodium soap solutions. The insoluble metallic soaps separate as curds, which are washed free of salt, dried and ground.

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In the manufacture of wire drawing soaps it is quite usual to incorporate "additives" in the lubricant. Free lime, for example, is frequently added to wire drawing soaps to make the lubricant "leaner", thereby reducing the rich lubricity of straight soap and providing proper balance to the frictional characteristics required. There may also be certain materials present as contaminants. Among additives and contaminants present in soap lubricants are the following: lime, chalk, fat, free

fatty acids, water, free alkali, extreme pressure chemicals, detergents, waxes, glycerin, unsaponifiable material from fat, perfumes, etc. This long list cannot emphasize too strongly that two "soap" lubricants prepared by different manufacturers and described, for example, as "calcium stearate" may vary considerably in performance characteristics.

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It is to be noted that the sodium soaps are water soluble but generally less efficient than their metallic (usually calcium) water insoluble counterparts. Sodium soaps are especially desirable for use where the lubricant must be removed from the wire in a subsequent operation, as in the preparation for liquor finish, galvanizing, tinning or lacquering. Aluminum soaps are most commonly used in drawing cold heading wire because they give a hard, nontacky film which minimizes sticking of dies in extrusion machines.

2. Petroleum Greases

Greases are frequently used where extra bright or clean finish on the wire is required, such as for coat hanger wire. Grease drawing is accomplished in dry drawing machines simply by using grease in the lubricant box.

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A petroleum grease is a mineral lubricating oil that has been gelled by addition of soap. The most common grease in service is "cup grease," which is made from a high titre calcium soap as the gelation agent. The addition of lime to the grease is sometimes practiced to adjust the frictional characteristics for improved results. It is important that the consistency of the grease be heavy enough so that it does not run out of the die box and yet sufficiently soft to prevent it from channeling.

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In recent years special wire drawing greases have been prepared containing high concentrations of sulphurized and chlorinated extreme pressure materials. These more expensive products are superior to the calcium type cup grease in giving longer die life.

3. Soap-fat Paste Compounds

While the principal use of soap-fat paste compounds is in wet machines as water solutions, some of this material is used in the undiluted state as a dry drawing lubricant (oil or water is sometimes added to prevent channeling). A popular use of undiluted soap-fat paste compounds is in the lubrication of the die outside wet machines drawing non-ferrous metals, supplanting the more conventional use of tallow for this application. In the ferrous field, undiluted soap-fat pastes are used for drawing extra clean and bright wire when the finish from petroleum greases is not acceptable.

Concluding Remarks

A primary objective in any wire mill is to draw the maximum tonnage of wire at lowest operating costs. The profits of the mill and, in some cases, survival of the business will depend upon the degree of efficiency with which the plant can operate. The selection of the proper wire drawing lubricants represents a major factor in achieving maximum production.

Wet Wire Drawing Lubricants

by J. B. Bean
Wire Lubricants Division
Apex Alkali Products Company
Philadelphia, Pennsylvania

We all know too well, and quite appreciate the fact, that both swift and sure progress has been made in practically every phase of the Wire Industry during the last quarter century. There has been a constant race, with increased production the goal, between all the various suppliers of most of those components which go to make up the wire drawing industry. Improvements in one field have necessitated improvements in several others; thus we find that many advances have been made in wet wire drawing practices. This in turn has made it necessary that both tool and die design be changed. Cleaning house practices

Jerome B. Bean

have of necessity been revamped and over-hauled in order to keep pace with the advances made in wire drawing machinery. All of these factors have made it necessary for similar advances in the field of wire drawing lubricants.

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It will be the hopeful purpose of this brief paper to attempt to explain what lubricants either are being, or may be, used in the wet drawing of wire in the wire industry. At the risk of repetition we claim that the principal function of any wire drawing lubricant is to materially reduce the friction present and to eliminate the possibility of die-to-metal con-

tact. Thus in turn eliminating both the scratching or breaking of the wire being drawn, while reducing die wear and at the same time providing sufficient cooling properties.

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For the purpose of this discussion, we shall classify wet wire drawing lubricants into the following four categories:

1. **Straight soap lubricants**
2. **Emulsion type or soap-fat lubricants**
3. **Petroleum oil or petroleum oil derivative lubricants**
4. **Water-soluble oil lubricants**

Straight Soap Lubricants

Considering the first of these classifications as noted above, straight soaps primarily appear to function in the drawing of fine gauge wire. A broad range of experience would indicate that concentrations of approximately 1% by weight with water are sufficient. The straight soap-type lubricants are usually found in the non-ferrous field in the finer sizes of wire. I base this statement on the fact that over a period of years many wire mills have been rather reluctant to experiment with any other type material, although other wire mills have found, from experience, that there are appreciably better and far more economical products available for this type of wire drawing. Furthermore, I feel that these lubricants will, within the next few years, displace the straight soap-type lubricants. I would also like to add that there are available today, lubricants that will not only out-perform the straight soap-type lubricant but will keep the wire drawing machines every bit as clean as the straight soaps.

Emulsion-Type or Soap-Fat Lubricants

Now for a consideration of the emulsion-type or soap-fat lubricants. This particular type of material is generally used for both copper and brass wire, as well as for ferrous wire beyond 20 gauge size. A multiplicity of soap-fat lubricants are available today. To simplify this situation, we shall see that most of these materials contain a water-soluble soap, combined with fatty material and moisture. For best results in the copper and brass wire drawing fields, a **high fat** and low soap combination seems, from experience, to produce optimum results for the **coarser sizes** of wire. On the other hand, **low fat** and high soap combinations have proven best over the long run for the **finer sizes** of non-ferrous wire.

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I would like to discuss briefly copper soap formation. Copper soap is caused by free fatty-acid reacting with copper dust to form a copper stearate or oleate. Now some of the disadvantages of copper soap formation include:

1. **Clogging of the lubricating system**
2. **A reduction in the concentration of the compound**
3. **Causes tackiness on capstans**

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Let us now take the time to consider methods for correcting this situation. At the present time, there are various complexing agents available on the market. A complexing agent will react chemically with an insoluble copper soap and solubilize it. In other words, it will cause the copper soap to go back into solution. After the chemical reaction takes place making use of the copper soaps, it allows the copper dust to fall free and hence to settle out. Allow me to take a few moments to attempt to explain this complexing agent. Complexing agents are known as chelating (key-lating), and chelating means "crab" or "action of crab". Now then, what actually happens is that the complexing agent grabs onto the metal of the copper soap, removing it, and replaces the metal with either sodium or potassium. I have used copper soaps as an example only. However, the same action applies to the ferrous field. The complexing agents will perform the same function in ferrous wire drawing for such conditions as iron soaps and lime soaps.

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I believe that it can be safely stated that there are many diverse variations (formula-wise) recommended and employed in the drawing of ferrous wire. This is necessarily so, due to the multiple number of variables such as the carbon content of the wire itself, the coating which has been applied to the wire, if any, the variety of finishes required on the wire, and the water hardness of the water used by the particular mill in question in their lubricating system.

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Again I would like to bring out certain points which I feel are important. Once the optimum concentration of the lubricant has been determined, the concentration should be maintained by regular and periodical chemical tests. These chemical tests should be for total fat content, or ratio of soap to total fat content. These two constants can be determined readily and with sufficient accuracy for plant or mill use. The soap content can be determined by titrating a portion of the in-use emulsion with standardized acid and results calculated as sodium stearate or sodium oleate. To effect this, take a measured amount, usually 100 cc of lubricant solution adding sufficient concentrated acid so as to split the emulsion, but allowing the fats to separate in a sharply demarcated layer. Then measuring the volume of fat. This may be done easily in a graduated cylinder. Once a given amount of soap is determined, it represents a certain concentration of compound in the emulsion. What we wish to bring out is, that to obtain the most economical and efficient use of any soap-fat lubricant, it should be checked as frequently as is practicable, so as to maintain the optimum concentration of compound in the emulsion. A development of rather recent date is the tendency toward the drawing of fine aluminum wire in soap-fat compositions. This procedure is actually in use at the present time, in several regular production setups.

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It would appear that the concentration of soap-fat composition to water ranges from approximately ½% for the finer sizes to a maximum of 8% when employed for the initial reduction of rod, or in the shaving operation in the case of some copper rod. For fine ferrous

wire a low-soap high-fat combination appears to be most generally in use, with the concentration being kept within a normal operating range of from ½% to 4%. As mentioned earlier in this paper, it is most essential that any wet wire drawing lubricant must provide both lubrication **and** cooling. The amount of lubricant-film required will depend entirely on the size of the wire being drawn and the percentage of reduction being made upon the wire in the machine. Wire drawing machines designed specifically for production of finer sizes of wire make it mandatory that the wire drawing lubricant be thinned out to that consistency which will guarantee non-clogging of the dies. If allowed to occur, it will of course, cause wire breakage due to excessive frictional heat.

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In the finest sizes we require a lubricant which must be devoid of tackiness for it is in this field that the wire may stick to the capstans if tackiness be present, subsequently causing breakage of the wire and unwanted down time on the machines.

Petroleum Oil Lubricants

Now for a consideration of the third classification. Petroleum oils are essentially straight mineral oils into which fatty material and quite often other additives have been incorporated, along with synthetic material of a fatty nature, which tend to adhere strongly to a hot metallic surface. This type of wire drawing lubricant is rather widely used for the production of aluminum wire of practically all sizes. I would also like to include petroleum greases for aluminum wire drawing. A considerable number of mills are using straight mineral oils into which are blended the different additives to give the oil an extreme pressure characteristic, which provides better drawing qualities.

The petroleum oil, with the additives incorporated, is a material which is rapidly gaining wide acceptance for the drawing of fine stainless steel wire in continuous wet drawing operations. Heretofore, it will be noted, the characteristics of the combined oils made them necessarily less efficient as a coolant. It can be safely stated today that this type of material is available in such form as to include not only the lubricating qualities of a petroleum oil lubricant, but also the greatly desired coolant effect of the water soluble materials. This has been found to be particularly true in the drawing of fine stainless steel wire, where the lubricant in question has been prepared by blending both fats and extreme pressure additives in to a light viscosity lubricating oil. The extreme pressure materials may be either sulphurized or chlorinated compounds or sometimes both. These additives tend to react with the metal to form a protective metallic-like surface which is, in turn, highly resistant to welding and seizure.

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Extensive uses of chlorinated waxes are being employed for special finishes on uncoated stainless steel rod and wire. The purpose here is to help obtain special bright finishes, suitable for electropolishing.

Water-Soluble Oil Lubricants

The water soluble oil is a prime example of a true emulsion. Text books describe an emulsion as a mechanical mixture of two or more insoluble liquids such as oil and water. Now a water soluble oil becomes an emulsion when a mineral oil is combined with an additive or emulsifier which enables the mineral oil to be easily mixed with water. Coupling agents may be added to insure emulsion stability. Water soluble type lubricants are best suited for very light reductions where a heavy-duty type lubricant is not necessarily required. This type lubricant is quite generally used within a concentration range of from 2% to 10% by volume. Various mills employ such a material occasionally in place of the heretofore mentioned soap-fat combinations for high speed continuous wet drawing, because of their excellent cooling qualities and almost complete absence of foaming. This type lubricant also serves a dual purpose, in that it provides a rust resistant film on the wire, plus the fact that it makes a stable emulsion in hard water areas. I might add that it makes for a very clean machine and requires very little handling for mixing.

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I should like to close my paper with a remark from the book "Steel Wire in America" by Ken Lewis: "You know, there are three stages in a man's familiarity with his craft. The first stage, he knows so little that he is ready to try anything reasonable. The second stage, he knows so much that he is reluctant to try anything whatsoever because he realizes how delicately balanced is the process and how a small change will wreck it completely. Then there is the third stage in which, having had leisure for study and contemplation, he has learned to discriminate between what is basic and what is expendable!"

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It is my firm conviction that when sufficient numbers of us have reached this so-called third stage, both we as suppliers and you as consumers, that even greater advances will be made in the field of wire drawing lubricants. Thank you.

The discussions that followed the presentation of the foregoing three papers and those recorded at the various other technical sessions are reproduced on the succeeding pages.

Wire Association Proceedings

Discussions of Papers Presented at the Annual Convention of The Wire Association at Detroit, Michigan, November 8-11, 1954

JOINT SESSION, FERROUS AND NON-FERROUS DIVISIONS

MONDAY, NOVEMBER 8th

The Joint Technical Meeting of the Ferrous and Non-Ferrous Sections of The Wire Association convened in the Hotel Statler, Detroit, Michigan, at 2:00 o'clock p.m., John H. Richards, Jr., Chemical Engineer, Apex Alkali Products Company, Philadelphia, Pa., presiding.

Chairman Richards, Jr.: Members of The Wire Association, Friends and Guests: That fine old State of Maryland is noted for several things: Good horses, lovely ladies, excellent bourbon (commonly called Mountain Dew, I understand, in the State of Maryland), and Red Crewe. In that order, if you please, it seemed proper that Red should follow certainly the horses. I understand he does. He has always had a good tongue for a spot of bourbon. Rumor hath it that he continues to follow the women. I think some of you may be as surprised as I was to learn that Cockeysville, Maryland, bore that name even prior to the time that Leonard Crew made it the center of the wire industry of the USA.

Without further ado, gentlemen, I present your President, on the Twenty-Fifth Anniversary of The Wire Association, Leonard C. Crewe, Jr. (Applause)

President Crewe: Chairman Jack, Guests of The Wire Association and Members: It is my distinct pleasure to extend to you the greetings and welcome of the officers and directors of The Wire Association.

The first official convention was held in Cleveland in 1931, so we are opening our Twenty-Fourth Convention today. However, there was an informal gathering of wire men and a program of technical papers in Buffalo in 1930. That is our real birth year; thus our Silver Anniversary celebration this week in Detroit.

The phenomenal growth of the membership of the association from a mere handful to a figure approaching 1100 has been entirely spontaneous. It is the genuine interest of dozens upon dozens of our members in the association affairs that has led to the success we have enjoyed throughout the years, and believe me, we have had a lot of success in promoting the original objectives, the thing the association was formed to do, which have come along in great style through the years.

It is the sincere desire of your officers that each individual member be given an opportunity and be encouraged to participate in our activities. We realize there is an untold wealth of untapped material and talent in our midst and we encourage you all to participate.

Your General Program Chairman for this occasion, Earle Glen, with his Ferrous Division chairman, Ray Worth, and Non-Ferrous Division chairman, Jim Flood, has arranged for your pleasure two highly diversified and quite interesting technical programs. We have plant visits arranged for Thursday through the Carboloy Company and to the Ford Motor Company at Dearborn. The ladies are urged to attend this plant visitation.

The Annual Luncheon on Wednesday I am certain will be a very special occasion, and we hope to have the greatest possible attendance on that day.

I am particularly pleased when I look over the roster of registration to see friends here from allied countries. We have Austria, Australia, Belgium, Mexico, England and Canada represented.

The real meat, the real benefits that come from these meetings, are the open discussions which follow prepared papers, particularly when these discussions are well flavored with international seasoning.

Again, gentlemen, it is a privilege and great pleasure to welcome you on this opening day of our Silver Anniversary. (Applause)

Chairman Richards, Jr.: Thank you, Leonard.

The symposium on lubricants this afternoon will consist of three prepared papers followed by a question and answer period. The first speaker on this afternoon's panel will be Leon Salz, Manager of the Lubricants Division, Magnus Chemical Company, Garwood, New Jersey. (Applause)

Mr. Salz presented his prepared paper. (Applause)

Chairman Richards, Jr.: Gentlemen, the second paper this afternoon will be presented by Jerome B. Bean, Wire Lubricants Division, Apex Alkali Products Company, Philadelphia, Pennsylvania. (Applause)

Mr. Bean presented his prepared paper. (Applause)

Chairman Richards, Jr.: Gentlemen, the third member of our panel this afternoon will be Dr. Gray Verner, Technical Director of the Standard Industrial Compounds Company, Chicago, Illinois. (Applause)

Dr. Gray Verner presented his prepared paper. (Applause)

DISCUSSION

Chairman Richards, Jr.: Thank you, gentlemen.

We will now call on the panel members to answer those questions which have so far been turned in.

Mr. Salz, would you be good enough to answer your questions?

Mr. Salz: The first question I have is this: What is the value of a graphite emulsion as a wire drawing lubricant?

Graphite definitely is a lubricant but it is not used very much in the wire industry. Its principal application is in the drawing of wire that can be elongated most effectively at high temperatures. Such wire is tungsten and rhodium. The conventional materials—that is, the dry soaps, soap fat pastes—are more efficient under room temperature conditions.

The second question: Do you sell the fat separately which you use in your soap fat formulas?

The answer is no. Anyone who wants to purchase fat as an individual component can obtain it from many suppliers who are in that business as a raw material.

I might add in this connection that if one were to manufacture a soap fat paste combination in his own plant he could not add the components individually to his tank. They would have to be blended together not only as a physical mass, but adjustments would have to be made for acidity or alkalinity depending upon the job for which this lubricant is to be used.

Chairman Richards, Jr.: Thank you, Mr. Salz.

Does that satisfactorily answer your question?

A Member: My question really is a little different. Since in the drawing solution you do have changes, as Mr. Bean suggests, tallows, saponified; later on you get a fatty acid and it becomes a copper soap. If you cannot add tallow, how can you accept the drawing solution which is formulated for initial conditions to hold up in the long term when these changes are taking place constantly?

Chairman Richards, Jr.: Would you like to spill a little tallow, Mr. Bean?

Mr. Bean: I am going to get off the hook right now. I am no chemist. I just go out and talk about this material. I am not going to stand here and try to tell you I am a chemist, either.

Are you referring to these chelating or complexing agents?

A Member: That and the fat itself.

Mr. Bean: I think Mr. Salz will back me up on this. Actually what the complexing agent does, the way I understand it, is remove the copper soap and utilize them. In other words, it turns it into a sodium base or calcium base and puts that soap to work again instead of it being congealed into a copper soap and held there; it puts it back into solution.

I will say this: that the complexing agent, unfortunately for the supplier, does lengthen the life of the solution considerably. I have seen it work, and I wish I had not even mentioned it. (Laughter)

I hope that answers the question as to further explanation. However, I would like to suggest that if you do have any further questions, want further details, that you forward your inquiries to Wire and Wire Products. They will see they get to the proper channels. Also, I think we are to refrain from mentioning brand products up here. I have a question here which asks us to name them, but I do not think it is proper to do that at this time.

Chairman Richards, Jr.: Did the party submitting the question as to the value of the graphite emulsion as a wire drawing lubricant receive a satisfactory explanation?

Dr. Verner, would you answer your two questions, please?

Dr. Verner: The first one I am not going to answer. It asks: What supplier furnishes the best lubricant? I recognize the handwriting. (Laughter)

The second question: Both sulphur and chlorinated additives have been mentioned. What about phosphorous, phosphate additives? Are they used, and where?

Elemental phosphorous is a pretty reactive material and I personally do not know of any place where it is being used. However, I stand subject to the correction of the other panel members. Phosphates in dry drawing lubricants are used for their separating characteristic, and I rather imagine this question should have been directed to Jerry.

Phosphates, as I understand it, are employed in wet drawing solutions to make them more stable to the hardness of water and thereby prolong the life of the wet drawing solution. It would also, I think, tend to make them more stable to the adverse effect of this copper soap formation which has been mentioned. In other words, it might be considered as kind of a mild chelating agent.

Mr. Salz: I have a comment on that. From our experience, the most effective extreme pressure material in a drawing operation is a chlorinated compound. Sulphur compounds do not seem to be as effective as a general rule. I know a very few formulations in the drawing field that add a phosphate compound to the wire drawing lubricant as such.

The most usual application of phosphorous compounds in the wire industry would be in phosphatizing the metal. That is something entirely different. In that case a phosphorous compound has chemically been reacted with the metal to give greater ductility to the metal and enhance its drawability.

Chairman Richards, Jr.: This next one is not a question, but a statement of fact. I am sure the submitter, our good friend in the front row, may wish to further comment. This statement is directed to the attention of Jerry Bean:

The simple titration of a used wire drawn emulsion is okay for a fresh emulsion, but when the emulsion gets old and you get copper soap in solution it is necessary that a different approach be made for true soap determination.

Would you briefly acquaint us with the new and different approach?

A Member: In the direct titration of a soap the soap is hydrolyzed in solution. You have the sodium hydroxide ions and you are reacting or neutralizing that with acid, whether hydrochloric or sulphuric acid. From that, using the correct factors, you can work out the soap.

When you use a wire drawing emulsion for a period of time you get the copper soaps. A copper soap is on the same basis as sodium soap. You have the alkaline end, the copper, and the acid end, which is the fatty acid. All right, so you go ahead and titrate it. Actually when you are titrating the sodium stearate you are also going to titrate the copper stearate. In that way you will get a reading for a soap which is much higher.

We get quite a few samples of emulsion in the laboratory to check for fat. We found it was necessary to dehydrate the emulsion down to dryness, take it up in alcohol and filter it.

The copper soaps are not very soluble in alcohol solutions. The sodium soaps, potassium soaps, are. We would separate the insoluble soaps from the soluble soaps, evaporate off the alcohol from the sodium soap solution, take it up with water, then do a titration. In that way we have found quite an appreciable error due to the copper soaps.

Are there any questions on that? That is all I wanted to say on that. In other words, it is a very misleading titration, just the simple titration of a wire drawing emulsion.

Dr. Verner: I don't know what you are doing to me here. I am getting a lot of questions on wet drawing which probably would be better answered by Mr. Salz. However, I will do my best.

Here is a question: In the wet wire drawing process has there ever been an attempt to use an ionized lubricant?

I think the answer there is probably that there may have been an attempt, but not a very successful one. I think the reason for that is this: that many of the wet drawing lubricants are emulsion type lubricants. Immediately upon the build-up of any great concentration of ions in there you would have a tendency to break down the lubricant. You would have a layer of fat on your tank, which you may have had at some unhappy time.

Do you want to comment further, Leon?

Mr. Salz: I am not an expert on wet drawing, but I will comment on ionized lubricants: that is, those water soluble soaps, when put in solution that are in ionic form. They divide into two basic parts: a positively charged part and a negatively charged part. In so doing they become ionized, although it is true that they are very weakly ionized. In other words, they do carry an electric current to a very minor extent.

Chairman Richards, Jr.: Do you want to answer the balance of your questions?

Mr. Salz: All right. The next question is: Is any satisfactory molybdenum sulphide wire lubricant on the market?

I wonder whether the person who asked the question would perhaps amplify it so I know exactly what he is referring to?

A Member: Molybdenum sulphide has been used as a lubricant in anti-friction bearings. It has been recognized for some time that the molybdenum sulphide film would probably be better in some instances than the positive soaps. Is there any commercial application in the wire industry of the molybdenum sulphide soaps?

Mr. Salz: We have done some experimental work with the addition of molybdenum disulphide in incorporating it into a dry drawing soap. Our experience has been that there have been no profound effects. That does not mean that there are not applications for molybdenum sulphide in the wire industry. It might be used perhaps as an additive in a difficult operation. I don't like to get into the subject of molybdenum sulphide too extensively because it sort of treads on the toes of some manufacturers of that type of material.

The next question: Has there been any attempt to utilize ultrasonic waves as an aid in wire drawing? Not to my knowledge.

Next question: Would fine copper wire from .010" to .002" drawn with water soluble oil lubricant be as suitable for insulating coating — that is, enamel — as wire drawn using a high soap-low fat emulsion lubricant? In other words, which leaves on the copper the least amount of coating that might tend to reduce adherents between the baked enamel and the copper?

From the standpoint of wettability, the wetting characteristics of soluble oil emulsions are generally poorer than soap fat paste combinations. Consequently, I would expect that emulsions would leave less of a film. However, there are two points I want to bring out here. First, in drawing in the range from .010", especially down to .002" it is difficult for a soluble oil emulsion to perform satisfactorily as a lubricant because there appears to be too much tension between the wire and the block; as a result the wire breaks. I would say from my experience that if you go below about .00[illegible]" in diameter you run into severe difficulties with a soluble oil emulsion.

I might also point out here that the usual composition of the soap fat paste combination in the range in question is a high soap-low fat. That is the way it is indicated here, and that is correct.

Chairman Richards, Jr.: Did that answer satisfactorily the person who asked the question?

Jerry, do you have a question?

Mr. Bean: There are two questions here. First: What about lead coating for drawing stainless steel?

Up to the last time I was in the stainless field it was still doing the only job I know of. I have not seen anything to take its place in most cases.

The second question: What are the lubricants that can be used for drawing fine stainless steel wires?

Again I hesitate to make any reference to brand names. However, there are several suppliers who do have oils for that purpose. I assume that that person means continuous high-speed or fairly high-speed wet machines.

I think on all these questions, gentle-

men, if you will direct written inquiries to Wire and Wire Products they will forward them to the proper people.

Chairman Richards, Jr.: We have now three questions to be answered by Dr. Verner.

Dr. Verner: The first question: At how high a speed can coated carbon wire be drawn without losing lubricant qualities by temperature rise?

Frankly, I do not know. I don't think anybody does. However, I think perhaps an explanation is due the questioner. That is this: that as you make mixtures of the two types of components that I mentioned in the body of my paper — the separator type and the fatty or lubricity type — you get as you increase the concentration of the separator type a resultant lubricant with a higher melting range. That is, pure soap, for example, would not have as high a melting range as a mixture of half soap and half lime, to come down to very simple facts. The higher the percentage of inert ingredients present the higher the melting range of the resultant lubricant.

My feeling so far as high-speed drawing is concerned is that there are probably lubricants that will serve satisfactorily at the highest speed anybody is drawing at the present time. I think I am safe in saying that right now if you set a speed which is reasonable with your equipment, we can develop the lubricant which will serve satisfactorily at that speed.

The next question: What is being done in the line of lubricants to prevent smut condition on annealed wire?

As I see that problem, the smut that is on the annealed wire is unburned carbon from the decomposition of the lubricant at the annealing temperature. The answer to the problem lies in getting as thin a film of lubricant on the wire as possible, thereby leaving a minimum of smut.

Question: What has been your experience on the effect of the pH factor on carbide die life?

Frankly, I do not have any. Does anyone here have any comment to make on the effect of pH on carbide die life? Speaking as a chemist, the pH is the acidity of the solution, and in general in wet drawing solutions the practice is to maintain the pH as nearly neutral as possible. What would happen when the pH got way low, which is on the acid side, I am not able to say. Does anyone know?

A Member: I was going to bring this problem up, because people have almost forgotten that pH existed. Hydrolvzation in the case of wet drawn solutions is most important, because the minute you get to the acid side, below 7 in pH value, you start depositing the soaps. They come out of solution, no longer remaining in there.

If you start depositing the soaps you are going to get a concentration of acidity which will cause rusting as well.

Generally speaking, a control of pH in the neighborhood of 7.4, just over the alkaline range, is highly desirable. It should be maintained by additions of an alkali.

I have been wondering if someone in the panel would care to comment on alkali conditions in wet-dry solution?

Dr. Verner: The pH control is something that is practiced and I know that you have to be very careful that you do not add the alkali to too great an extent. If you get too much on the alkaline side it causes quick deterioration of the system. The wire breaks if the alkalinity gets too high. So it is a matter of a controlled range; that is, you do not want to get it on the acid side, and neither do you want it to be too alkaline.

Does anyone else want to comment on that?

A Member: We have been doing some work on pH and have been trying to determine the effect of pH upon emulsion. We have found out some very interesting things about it. I assume you are talking about steel wire, is that right? We did some work mostly with copper, and I will show you what we got.

What we did was to have copper dust present in the emulsion, maintaining the temperature and bubbling air through the emulsion. In other words, we wanted to get a condition something like you would have in the plant of the emulsion absorbing air, some carbon dioxide, getting some oxidation, forming some carbonates. We plotted pH against the time. We found out, for instance, in a copper wire drawing emulsion that the pH of either ours or competitors' wire drawing emulsions ran around 9.3, 9.4, 9.5, depending on the actual concentration in the emulsion, the soap or fat concentration.

As we went through it we found the pH dropped rapidly, got to about 8.9, then started to level off. It dropped very slowly for a period of time and then it started to drop again, a rapid drop until it got to about 8.4 and leveled off at a slow drop.

Going by past experience in wire drawing emulsions involving copper, we found when it got to about 8.3 we were in trouble. When I say we were in trouble I have to back it up with this statement: We draw coarse wire, intermediate wire, fine wire. It is all copper wire and it all gives you trouble. However, the trouble point will vary, dependent upon the type of wire.

For instance, if we are drawing coarse size copper wire we could drop close to 8.3 and not have trouble because the wire and machines are heavy. You will not have too much sticking or loading up of the machines. With the intermediate size copper wire, when you get to about 8.5 you may start to have trouble. Of course, we recommend that by the addition of some caustic soda, caustic potash you maintain the pH up around 9.0.

Getting to fine size copper wire, especially when you get all the way down there, the trouble really starts. It is hard because the dies are very small. Especially when you start to get an accumulation of copper soap the wire will stick to the capstan and start to break on you. Therefore we recommend that on drawing the fine copper wire you should maintain the pH at a minimum of about 9.0. As I say, the pH levels for the different classes of wire depend on the gage of wire being drawn.

One of the things that is happening is this. I have not been able to prove it yet, but we will one of these days. Perhaps someone here can answer it. We believe when you start to get 8.5 you start to form these acid soaps. Frankly, we have found acid soaps to be very good lubricants for certain types of purposes. However, acid soaps by themselves have lost pretty nearly all of their detergency.

In drawing wire, especially the fine and intermediate sizes and on down, you have got to have detergency; otherwise the emulsion gets sticky, the wire sticks to the capstans, and the copper sludge which is formed is thrown right back at the dies. It does not wet out and drop to the bottom.

We have done some work along that line. We have found it is possible to do what we call replenishing of the emulsion by the correct addition of the chelating materials. What happens is that the pH does drop and then recuperates itself, drops further, and it just seesaws up and down, all the time on the idea that it still is dropping. We use a standard system and do not add any more fresh emulsion to the test. We keep the test always uniform.

It sort of recuperates itself and slowly goes down until even with the chelating materials in the compound you still get the acid sludge formation.

In the case of steel wire, most of the emulsions I have examined had a pH of about 9.0. I have never examined emulsions with a pH of 7.4. As a matter of fact, if you were to go to a pH of 7.4 with a soap type emulsion I don't think you would have much of an emulsion left. I think it would all be thrown out before you got that far.

Question: Is your rejuvenation done just by the use of chelating compounds or do you use some other additives?

A Member: It is already mixed in. In other words, no other additive is added, caustic or anything else. We have had it out on trial, of course, but none has been sold. However, that is one of the problems we have found in the wire industry.

A Member: To come back to the original question asked, what effect does the pH content have on the carbide die, it has been our experience that as the acid content increases it cakes the cobalt binder and carbide die which in turn causes pitting of the die and gives you scratch marks and pressed wear on the die.

Dr. Verner: Is that in wet solution or dry lubricants?

A Member: It is more pronounced in the wet condition.

Mr. Salz: I would like to make a few comments on the discussion that has transpired. First, as far as the pH of either a soluble oil or a soap fat paste composition is concerned, in either case they would be on the alkaline side and almost always above 8.0. The reason for that is that in both cases, either soluble oils or soap fat paste, there is the presence of soap.

Soap in water solution hydrolyzes to form a weak acid and strong alkali. As a result the emulsion will be on the alkaline side.

It might be interesting to note one of the major factors that contributes toward the lowering of pH when an emulsion is in constant service. That is the addition of carbon dioxide from the air. Carbon dioxide continually becomes dissolved and the emulsion forms carbonic acid which as an acid will tend to lower the pH of the emulsion or solution.

Chairman Richards, Jr.: Are there any further questions from the floor?

A Member: Which would be preferable

as a pH corrector, a potash or caustic soda, or caustic potash? I am beginning to think that the potash acts as a chelating agent.

Mr. Salz: I do not think there would be too much difference in the choice between caustic soda or caustic potash. They are both very strong alkalis. I believe it would be more desirable to add a weak alkaline material such as soda ash, the reason being that if you overstep yourself with caustic soda or caustic potash you really have gone pretty far. They are very strong. It would be hard to come back to the proper level.

Chairman Richards, Jr.: Are there any further questions from the floor? If not, thank you all for your interest as shown in the questions sent up here.

The last paper this afternoon is entitled, "Quality Control in the Wire Industry," by Mr. Axel U. Sternlof, Division Product Engineering, Electrical Cable Works, American Steel and Wire Division of the U. S. Steel Corporation, Worcester, Mass. (Applause)

Axel U. Sternlof: As a preface to my paper this afternoon, I think The Wire Association is to be congratulated on the achievements it has accomplished in the past 25 years, the officers of the past and the officers of the present; not on the job that has been achieved as a wire association, but, on the accomplishments that you have performed and that have been achieved for industry. The industry is grateful to The Wire Association.

The growth, as I heard here this afternoon, has been nothing short of phenomenal. I believe two other engineering societies might have achieved the same rate of growth: the American Chemical Society, and then the one which was born just a few years ago, the American Society for Quality Control, which in eight years has grown to a membership of over 8000.

I cite this growth to you as I want to bring you back 35 or 40 years. Who in h— ever heard of a metallurgist 40 years ago? A chemist was lucky if he made a hundred bucks a month. Today the industry all over the world, no matter what type of industry it is, is extremely grateful for the metallurgist and the chemist.

In the past few years we have seen come into being all sorts of engineers. The quality control engineer is probably the latest.

I come from New England. I had the pleasure of speaking in Springfield two or three weeks ago, Springfield, Massachusetts, and again in Worcester on the 18th of October. You know, New England was the cradle of American industry. I don't care what type of industry you want to consider, they all had their birth there in one way or another. Why? Because we had skilled craftsmen there. They were artisans in the trade. From New England they have branched out to all corners of the United States. Today New England is hard put to it to stay in the field because of stiff competition.

We have our raw materials shipped in and we ship our raw products out. We have double freight rates, high costs. So I am going to bring you a message from New England: that by means of quality control, unless you gentlemen get on the ball, as well as the rest of the country, competition is coming back and it is going to come from New England.

Last April I had the pleasure of presenting a very fundamental quality control paper to the Non-Ferrous Section of The Wire Association, meeting then in Worcester. In that paper I brought out the fact that quality control is a most valuable tool for the more efficient operation of industry, through the improved quality of its products and through the production of less scrap and reprocessed materials.

For the benefit of you who have no knowledge of what quality control means in the light in which I am going to refer to it, I want to state that we in quality control are applying to our industrial manufacturing processes the fundamental law that you or I cannot avoid. That is the law underlying our very existence, the law of probability and chance.

Fifteen years ago industry might have taken it as a passing fancy and a frill, would have laughed at it. However, today because of the great rapidity with which this new tool has been grasped by management, it is universally recognized as one of the most valuable if not actually the most valuable tool management has to meet stiff competition.

In the question and answer period which followed the presentation of that paper in Worcester, certain leading questions were asked, which eventually led up to the presentation of this paper here this afternoon.

DISCUSSION

Mr. Sternlof: Why do we want to go looking for a wider operating method? Why are we not satisfied with the conventional method? The conventional A.R method, the first one on the left of the chart, is all right for a mass production or highly repetitive operation. However, where you have a job shop it is very difficult to try to apply, for the simple reason that you will consistently, because of the many changes of setup that you have, be reporting points out of control when they are actually not out of control.

These two methods, the modified and total spread method, have been and are being used in job shops with very good success. (Applause)

Chairman Richards, Jr.: Thank you, Axel, for a very excellent presentation. If there are no questions, I want to thank you all again.

The session adjourned at 4:30 o'clock p. m.

FERROUS PAPER DISCUSSIONS TUESDAY MORNING SESSION

November 9, 1954

The Ferrous Section of The Wire Association convened at 9:45 o'clock a.m., H. Clark Smith, Jr., Superintendent of the Heavy Wire Division, Wilbur B. Driver Company, Newark, N. J., presiding.

The first speaker this morning will be Robert A. Stebbins, Assistant Superintendent, Rod and Wire Division, Bethlehem Steel Company, Johnstown, Pennsylvania. Mr. Stebbins graduated from Bucknell University in 1941 with a B.S. in Chemical Engineering. He started his employment in the Bethlehem Steel Company Loop Course in the same year in Bethlehem, Pennsylvania, and started work at the Rod and Wire Mill at the Sparrows Point Plant. Most of his time at this plant was devoted to research and development work.

In 1949 he was promoted to general foreman of the wire drawing and heat treating units of the Johnstown Plant, and in 1950 he became the assistant superintendent of the Rod and Wire Mills.

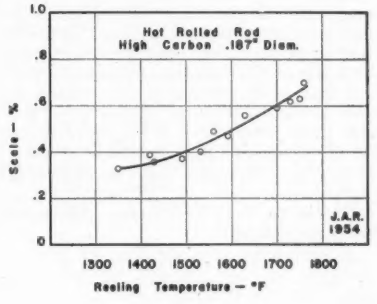
Mr. Stebbins' topic this morning is, "The Effects of Coiling Temperature on Hot Rolled Rod."

Mr. Stebbins presented his prepared paper. (Applause)

Chairman Smith, Jr.: That was a very nice paper Mr. Stebbins.

DISCUSSION

Are there any questions from the audience? I think Dartrey Lewis of Roebling's has some charts on similar work they have done at Roebling's.



A Member: It is very well worthwhile coiling rods at low temperature to save scale. If you can save a quarter per cent of scale, because the tonnage is so high and the price of rods is a consideration, it is well worthwhile.

At Roebling's we made some similar experiments to those Mr. Stebbins has described. Our mill has pouring reels. The rod coils weigh 400 pounds. Our scale percentages have come out rather lower than Mr. Stebbins'. I believe the reason for that is that the pouring reel gives a more open coil, and our rods after coiling on a conveyor go through a tunnel. We have powerful fans that draw cold air in at both ends of the tunnel and exit somewhere near the center. So there is quite a lot of air cooling after coiling. This rod is a 3/16 rod. Probably its small size contributes to fairly rapid cooling.

You will see that we got down a little bit below .4 per cent of scale for our lowest coiling temperature, and we went up to 12.7.

In connection with the saving of acid, our acid consumption is around 25 pounds per ton, which would somewhat confirm your figures, Mr. Stebbins, for the saving of acid if you can get a fairly low per cent of scale. (Applause)

Chairman Smith, Jr.: Are there any other questions or comments.

A Member: How was the temperature controlled in the experiments?

Mr. Stebbins: That question involves quite a bit of explanation, because I can tell you only as it applies to the Johnstown Rod Mill. Of course, all fac-

tors have to be considered. First is the speed of the mill, which is 3200 feet per minute. We have a distance of about 30 feet from the last stand to the first reel. In between the last stand and reel we have four water breakers and three 3-foot sections of double pipe, the water entering the outer pipe and the rod of course being inside the inner pipe.

The inner pipe is impregnated with holes to build up an additional pressure which is sprayed on the rod as it passes through. We find that we have been able to control this very well with this type of a cooling arrangement.

Does that answer your question?

A Member: Yes. However, you did not change your rolling temperature in the reheating units?

Mr. Stebbins: No, we did not change the rolling temperature at all.

I might add to this last discussion on further cooling that it was done at Sparrows Point. I don't know if anyone here from Sparrows Point would care to remark on that. If not, I will.

Sparrows Point does do some further cooling. As you noticed in the paper, I said that no forced cooling was added beyond the point of coiling. However, they do have an arrangement where they do additional air cooling after the coil has been completed. By using this additional air cooling they were able to get their scale down from the 1.15, approximately, to 0.65, which is more in line with the other figures which you saw.

Chairman Smith, Jr.: Are there any other questions?

A Member: I would like to ask Mr. Stebbins at how low a temperature he can go before putting on the air cooler? I noticed on the chart he shows 1350°. Can he get that temperature going into his pouring reels, or does he get that after the air cooling?

A Member: From a practical point of view, 1450° is about as low as it is reasonable to go.

Chairman Smith, Jr.: Are there any further questions or comments? If not, thank you, Mr. Stebbins. (Applause)

We will next hear from Leon B. Rosseau, Vice President of the Ajax Electric Company, Philadelphia, Pennsylvania. Mr. Rosseau's topic is "Processing of Wire Products in Salt Bath Furnaces." (Applause)

Mr. Rosseau presented his prepared paper. (Applause)

DISCUSSION

Chairman Smith, Jr.: Thank you, Mr. Rosseau, for a fine paper. I am sure it created a lot of interest here.

Are there any comments or questions for Mr. Rosseau? I jotted down one question that occurred to me.

I did not quite understand, Mr. Rosseau, in the salt bath patenting operation how the salt is removed from the wire after it leaves the quench bath; is it pickled off, and does it increase acid consumption?

Mr. Rosseau: The salt used in the patenting operation is a mixture of sodium potassium nitrate, which is exceedingly water soluble. So it is removed after the operation by a dip in the cold water tank before any cleaning operation is involved. All of the salt will be removed. So there should be no adverse effect on acid consumption.

Chairman Smith, Jr.: Are there some other comments or questions?

A Member: What is the purpose of and how is the salt bath used in the aluminizing process?

Mr. Rosseau: That is a question which is a little difficult to answer at the moment, partially because the two processes I mentioned are not identical. If we take the General Motors Aldip process as one example, it consists of highly fluxing salt, one which cleans the surface of the product to be coated thoroughly, while at the same time it preheats it. In that kind of an operation the salt bath furnace will be used as a first step, the work being introduced into the furnace reasonably clean and then preheated up to 1300° to 1350° F. and fluxed in one operation. It is then submerged in a molten aluminum bath for a very few seconds and removed.

In the Moeller process the method is different in that the aluminum and the salt are carried in a single furnace with aluminum floating on the surface of the salt. In that case you might say the salt serves a triple purpose. It melts and keeps the aluminum hot, No. 1; it preheats the work, No. 2; and it fluxes the work, which would be No. 3.

I don't know whether that answers your question or not.

A Member: Yes. I am surprised that the salt is compatible with the aluminizing, that you can actually coat steel with aluminum after it has a coating of salt on it.

Mr. Rosseau: It not only is compatible, it is very desirable. In the Aldip process the aluminum is the rectifier for the salt. In other words, you must have aluminum in the furnace at all times because it will react or it will cause a reaction to go on, the exact nature of which I do not know, to offset the contaminants which obviously must be present in the bath as it cleans the surface of the work.

This aluminum is a constant rectifier. It carries on the reaction to a point where the end product is a sludge which settles out of the bath. You can maintain constant fluxing as long as the aluminum is present in the salt.

A Member: Can you give us the composition of the salt?

Mr. Rosseau: Well, it is a patented process. I do not have it in my head exactly. It can be gotten through General Motors.

Chairman Smith, Jr.: Are there any other questions or comments?

A Member: In the Moeller process and Aldip process the salt and aluminum are in contact with each other. Could you by any stretch of the imagination have a salt bath preheating and then maybe just for a distance of 15 inches to two feet have the wire come out to the air? Would there be that drag out and oxidation before it hits the aluminum bath?

Mr. Rosseau: I am not sure whether everyone heard the question. It referred to aluminizing of wire. As I understood the question it was whether using the Moeller process it would be possible to preheat and flux in a salt bath furnace, having no aluminum on top of it, and then by emerging from the surface of the salt through air for as short a distance as could be practical, and then re-entering a molten bath of aluminum without ill effect. Is that the correct question?

A Member: Yes, sir.

Mr. Rosseau: I am not sure I could answer it on the Moeller process. I don't know that it has been tried. I do not offhand see any reason why the short exposure to the air should be too detrimental. Assuming that the wire is at the proper temperature and is pre-cleaned effectively, it will be continuously covered with a film of salt. That film is continuous and would not permit oxygen to attack the surface of the steel below the film, providing only that the time between emergence from the salt and contact with the aluminum is short enough to prevent freezing of the salt.

I can answer that question more specifically on the Aldip process. It is done that way in many cases, but I do not know whether it would work equally as well on the Moeller process.

Chairman Smith, Jr.: Are there any further questions? If there is nothing further, thank you very much, Mr. Rosseau. (Applause)

The last paper this morning is by Mr. Donald K. White, Foreman of the #2 Wire Mill, John A. Roebling's Sons Corporation, Trenton, New Jersey. Mr. White was born in Springfield, Massachusetts in April, 1926. Prior to entering grade school he moved to Wilmington, Delaware where he lived until 1951. He graduated from Wilmington Friends School in 1944 and entered the Field Artillery branch of the Army in July of that year.

After receiving an honorable discharge from the service, he entered Worcester Polytechnic Institute in Worcester, Massachusetts, where he studied mechanical engineering. In June 1951 he received his Bachelor of Science degree in Mechanical Engineering.

He joined the John A. Roebling's Sons Corporation in the capacity of a foreman in the Steel Wire Mills Division in July 1951.

Mr. White's topic this morning is "Continuous Patenting, Cleaning and Coating of Steel Wire," This is a description of a very new and unusual patented line, which many of us have seen at Roebling's, New Jersey. I am sure this paper will be of great interest to most of us. (Applause)

. . . Mr. White presented his prepared paper . . . (Applause)

DISCUSSION

Chairman Smith, Jr.: Thank you for a very good paper, Mr. White.

Gentlemen, I am sure there are many of you who have patenting problems and who are very much interested in this rig. Do you have any comments or questions at this time?

A Member: What is the smallest diameter that you draw in thousand-pound bundles?

Mr. White: We have operated with .072. Does that answer your question?

A Member: That answers it, thank you.

Mr. White: We have had some difficulty with that in tangles from the payoff. But as far as taking up it is all right, and in cleaning. It is a delicate

size to handle, because any slow-down or anything like that is liable to burn the wire off in the furnace. However, we have operated with it successfully.

Chairman Smith: Are there any other questions?

A Member: In running the coated wire over the sheaves and through the guides you evidently scrape coating off. Do you find that causes trouble in drawing?

Mr. White: There is not too much coating scraped off, though there is some. Generally we have not had too much trouble with it. Occasionally we do have trouble. We feel that it might be the guides. We have gone ahead now with the idea of installing small sheaves in place of the guides, or more or less as a support for the guides, to guide the wire through the little ring that we have in the stand. We want to eliminate any scraping of course.

A Member: How long is the wire in that sulphuric cleaning tank?

Mr. White: Not very long.

A Member: The reason I ask, I wondered if you had any problem of acid embrittlement in that high concentration of sulphuric acid.

Mr. White: First off, the scale on the wire is not too heavy. It is more or less a haze. We accomplish that by the lead pan, by using the Zonolite, the vermiculite material, to cover the wire as it comes out of the furnace and enters the lead. By the time it comes out of the lead bath there is a small haze. The acid is more or less a flash cleaning operation.

The pan is 20 feet long and it is, let us say, 127 wide. We are running 107 feet a minute. It is .127 of an inch, running 107 feet a minute. For .082 we run 147 feet a minute. It is quite a short time. All you have to do is divide that out. I don't know what it is offhand.

A Member: What is the wire temperature entering the acid, approximately? You quench between 1000° and 1100° degrees did you say?

Mr. White: On those turn-around sheaves we have had some trouble with hot wires coming out of the furnace. I believe it was determined that the wire coming out of the lead bath was around 500. So I imagine by the time you get into the acid it is down about 400, 300 or so.

Chairman Smith, Jr.: There is a question which occurs to me. I wonder if you had trouble with scratching of the wire as it passes over the silicon carbide sheaves?

Mr. White: No, I don't think so. The silicon carbide people tell us they will only guarantee their blocks, if the wire approaching the blocks is less than 12° included angle, in other words, a 12° bend, with that slight bend there is very little pressure on the block. As a result there are very few scratches on the wire.

A Member: You say that wire coming from the lead bath hits the acid at about 300° F. Do you have any spattering or do you protect from the spattering?

Mr. White: Yes, there is some spattering there.

A Member: How about the operators? Do they object strenuously?

Mr. White: They change their clothes frequently. Their pants get kind of moth-eaten looking. We are trying to correct that, eliminate it. As yet we have not successfully taken care of that problem.

A Member: I was wondering if the wire is actually 2000° where it enters the lead, or is it less than that?

Mr. White: No, it is not. Let's put it this way: The speed at which you can operate the furnace depends upon the exit temperature. We generally try to keep the exit temperature about 1650°, 1750°, somewhere along in there. When it becomes hotter than that you can take one or two steps: Either increase the speed in the blocks, or decrease the temperature of the last two or the last zone at the furnace; that is, generally we aim at 1650°. If we are there, that is the temperature entering the lead.

Chairman Smith: Are there any further questions? If not, we thank you, Mr. White, for a very ably and well presented paper. (Applause)

. . . Whereupon the session adjourned at 11:30 o'clock a.m. . . .

TUESDAY PM SESSION
NOVEMBER 9, 1954

The Ferrous Section reconvened at 2:00 o'clock p.m., Frederick W. Leslie, Superintendent, G. F. Wright Steel & Wire Company, Worcester, Massachusetts, presiding.

The first paper this afternoon concerns "Prestressing Wires—Stress-Relaxation and Stress-Corrosion Up to Date," to be delivered by Gordon T. Spare, Research Project Engineer of the American Steel & Wire Division, United States Steel Corporation, Cleveland, Ohio. (Applause)

Mr. Spare presented his prepared paper.

DISCUSSION

Chairman Leslie: Thank you very much.

Are there any questions or comments on Mr. Spare's paper?

A Member: Have you made any stresses in your own tests for straight tension, direct tension? Some people have the idea that stress corrosion is much more dangerous when you bend a wire than under straight tension. Have you been able to correlate the two?

Mr. Spare: We have not yet had enough testing under simple tension. The difficulties involved make it impossible to test any large number of samples in that manner. However, we do have some underway and perhaps can report on those at a later time.

It is certainly possible that the larger plastic flow under some of the artificial tests, the bending tests, may be crowding the picture somewhat.

A Member: About four years ago in England it was felt that oil tempered wire would be excellent when under direct tension in a straight plane. Now that has gone out. People seem to be of the impression that oil tempered wire forms better when it is in a curved plane such as round, and so forth. I was wondering if you had any theories on that subject?

Mr. Spare: I am not certain that I understand the question.

A Member: It is a question of performance, you see. We were selling wire in Switzerland, using a direct straight tension. Now we cannot sell the darn stuff for that job. It now has to go into circular pipes. They say that the creep is such that when it is in straight tension all the concrete falls away.

Mr. Spare: Your question concerns the creep of the oil tempered wire?

A Member: Yes.

Mr. Spare: I am afraid we have not much information on the creep of oil tempered wire. It has been used so little here in this country that most of our testing has been done with cold drawn and stress-relieved, particularly the latter. Perhaps someone else might have something to add to that.

A Member: We have done very little work on oil tempered wire. However, I cannot see why it should behave any differently in a straight beam than in wrapping on a tank. I think it is probably just due to the stress level at which they are working. It may have something to do with the concrete. However, I cannot see where there should be any problem.

A Member: You told us that the sulfides and nitrate-bearing liquids are detrimental to the high stress wire strain. What can we do about it?

Mr. Spare: The best thing we can do is to insist on no corrosion whatsoever, by complete and careful covering of the wires immediately after they are placed.

A Member: You mean a mechanical coverage such as paper, grease or oil, or something like that?

Mr. Spare: No. It is the custom in prestressing to grout. Of course, in pretensioning, prestressing where the concrete is cast about the wires under stress, and then after the concrete hardens the stress is released to the concrete, then you have perfect coverage of the wires. However, in post-tensioning where the wires are introduced through holes in the concrete you stress after the concrete has been poured and you have the opportunity there for the entrance of waters carrying dangerous ions. There the custom is to blow in a liquid grout which gives rather good protection to the wires.

A Member: You still have the possibility of failure of the concrete allowing those detrimental liquids to become entrapped in there, or come in contact with the cable or wire.

Mr. Spare: That is right. Cracking of the concrete would certainly be dangerous if in contact with ground waters.

A Member: So it boils down to the best thing to do is to protect the cable with the wire in there.

Mr. Spare: That is right. Thorough protection, no corrosion whatsoever.

A Member: Have you any idea why nitrates and sulfides cause stress and corrosion and sulphates, for example, do not?

Mr. Spare: I am afraid I don't have a very good idea. It is true that the nitrates are highly oxidizing. The other ions, chlorides and sulphates, do corrode very rapidly. There is a possibility that they propagate or that generalized corrosion propagates ahead of localized corrosion. In other words, it stays ahead of any cracking that might initiate itself. However, I am afraid I cannot help too much along that line. The field

is still rather dim.

Chairman Leslie: Are there any further questions? If not, Mr. Spare, we want to thank you very much. (Applause)

Our next paper concerns "Phosphate Coating of Steel Wire." Our speaker is Mr. James S. Leland, Engineer of the Parker Rust Proof Company, Detroit, Michigan. (Applause)

. . . Mr. Leland presented his prepared paper . . . (Applause)

DISCUSSION

Chairman Leslie: Thank you very much, Mr. Leland.

Do we have any questions or comments on Mr. Leland's paper?

A Member: Is this employed on stainless wire or carbon steel?

Mr. Leland: The first part was carbon wire, but I talked a little bit about the oxalate coating for stainless wire being employed.

A Member: I mean for heading.

Mr. Leland: Not much work has been done on cold heading. It has been mainly cold drawing, bars, shapes on stainless.

A Member: Are you suggesting that your coating can eliminate the copper coating presently applied for cold heading?

Mr. Leland: No, I am not implying that. Probably my sequence there confused you. I went back to cold heading on carbon wire, which requires a phosphate coating. That is where all the work has been done.

A Member: You mentioned that the Borderite 70 is replacing Bonderite SS. Are you using the same type of lubricant coatings for all of the Bonderite 70 as Bonderite SS?

Mr. Leland: The coating is very similar in composition and everything else. We are still using SS in all of the heavy tube mills. However, on wire the 70 has certain advantages because of pickling, and so forth. The cleaning is less than on the 70.

A Member: What type of lubricant are you using in conjunction with the cold headings?

Mr. Leland: On cold heading we are applying a dip lubrication. It is a very thin lubrication because of filling problems on heads and such. In the die ahead of the cold heading operation they usually use a calcium or metallic soap to draw it.

A Member: You referred to Bonderite 70 as a substitute coating for drawing stainless rod, three holes. Do you mean you could draw at the same speed with the 70 as with lime?

Mr. Leland: Well, let us say most of the work on multiple-pass drawing on stainless has been done as a replacement for lime. I would like to give you some of the reductions. As I remember it, we are drawing .115 down to .069 in three-batch operations as speeds around 300, 400 feet per minute. I think lead will perhaps outperform that, but the advantage you have in these oxalate coatings is their ease of removal. With lead you end up with a pretty highly pickled surface identation in leading the coils.

A Member: You mentioned .115. Do you mean the coating is not suitable for larger diameters?

Mr. Leland: It is being used on larger diameters but mostly one and two passes.

Chairman Leslie: Are there any further comments or questions? If not, thank you very much, Mr. Leland. (Applause)

The third and final paper of the afternoon concerns "Acid Cleaning of Stainless Steel," to be presented by Mr. John H. Corson, Director of the Laboratory, Carpenter Steel Company, Reading, Pennsylvania. (Applause)

. . . Mr. John H. Corson presented his paper . . . (Applause)

Chairman Leslie: This has certainly been given us plenty of meat for discussion.

A Member: Is that all in preparation for either lead coating or lime coating, or which is it? In the lead coating what can you say about the flux that you use?

Mr. Corson: First of all, it is in preparation for either. I think there is one other thing which can be added to this for those of you who want a little assurance, so to speak. Often people want to activate the surface by pickling in a good hot sulphuric acid. In other words, putting coils in a tub, bringing it to a boil, and the coils are pretty generally activated. They are etched up a bit and will hold the lime or lead a bit better.

In answer to the second question, we at Reading do not use the flux. We lead coat the rods that we do draw at the Webb Division. We do not lead coat any rods at Reading. I am not acquainted with exactly what flux is used. However, they do use it and I will be happy to get that information for you.

A Member: Where you referred to sulphuric acid in conjunction with the Virgo salt, don't they usually use some chloride in there such as salt, to activate the sulphuric acid?

Mr. Corson: That has been done and can be done. I am not personally acquainted with it, however.

A Member: My experience with the sulphuric acid itself was that it was not too active.

Mr. Corson: It is one of those things that is difficult, when you have a sulphate and chloride ion in the same bath, to know how much of each you have. So you get back to the point where the guy sticks his finger in the tub and tastes it. He will tell you how strong it is. That is what you want to get away from.

By the way, we have some old cleaners who can do that. It is surprising how good a job they can do.

A Member: Do you have any figures on metal loss by any or all of the various cleaning methods?

Mr. Corson: I am sorry, but I do not have any figures at hand on this matter of metal loss. In our own cleaning house we clean both carbon steel and alloy as well as stainless steel. The results of ion build-up and things of that sort would be somewhat confusing. As to actually weighing coils, I just do not have that information handy.

Chairman Leslie: Are there any further comments or questions? If not, I want to thank you very much, Mr. Corson. (Applause)

I wish to thank all the speakers for a fine job.

. . . At 3:30 o'clock p.m the session was adjourned . . .

WEDNESDAY A.M. SESSION

NOVEMBER 10, 1954

The Ferrous Section reconvened at 9:45 o'clock a.m., Glenn R. Lee, Wire Mill Superintendent, Continental Steel Corporation, Kokomo, Indiana, presiding.

Our first speaker is the assistant director of research, Morgan Construction Company, Worcester, Massachusetts. He graduated from the Worcester Polytechnic Institute in 1942 with a Bachelor of Science degree in Mechanical Engineering. He is a member of the American Society of Mechanical Engineers, the American Society of Lubrication Engineers, the Society of Experimental Stress Analysis, and The Wire Association.

His practical experience has been in development engineering for the Pratt and Whitney Aircraft Division, from 1942 to 1946, and as design engineer for William Allen Sons Company from 1946 to 1948, when he joined the Morgan Construction Company. He was appointed to his present position in 1954.

It is a pleasure for me to introduce to you Mr. Norman A. Wilson, who will speak on the topic, "Cooling of Steel Wire in Continuous Drawing." (Applause)

Mr. Wilson presented his prepared paper. (Applause)

DISCUSSION

Chairman Lee: We will now entertain any discussion of Mr. Wilson's paper.

A Member: I want to compliment the speaker on the excellent paper he presented. The facts in it are very well put and very well analyzed. He has gone to a lot of work which is really something.

We work on a different principle; however, you have to take his fundamentals just as he takes them there. We do not run an accumulation block. However, you have to get your wire coat. What I usually do, in a practical way, is to go out and feel the wire. If the wire is cold or just warm to my hand, if I think it is cold enough, I don't worry about it.

We just made a little check after Mr. Wilson's paper came out in the magazine. We could not duplicate his conditions, of course. Unfortunately at the plant the superintendent would not cut down the speed to 1200. He decided he wanted wire off the machine. We took it in just as practical a way as possible. We find we get about the same answers he gets in a little less time, though not much. Where he has 12 seconds, we get the wire down in 9 seconds at the finish.

It proves that what he says is correct on that, only we do not run an accumulation. We dig it down with water. I think either way, if you can furnish enough air it would be all right. However, air gets to be quite a problem. In the first place, a man doesn't like it. He thinks he can get a cold with it. So we cut off the air on the stringing-up operation, then we put it back on when

the man is away from it.

When we ran our tests at Portsmouth we only had 5800 cubic feet of air. Even with that we got the same results. But we did have water. The water is the thing that we think makes the difference. While we ran .092 and only ran five dies, each die takes care of itself anyway if you take the heat out properly in between. So that does not make much difference; the tensiles would be approximately the same as Mr. Wilson states.

In addition to that we proved the point that you could take it out all the way down. The same machines that were running .092, the same battery—there was a machine which we have checked that has run .187 from .306. You have a long way to take the heat out of that. We slowed the speed to 690 to keep the temperatures within the same reasonable range, to keep the temperatures down to the same reasonable point.

I think Mr. Wilson deserves a lot of credit for the work he did on his paper. (Applause)

Chairman Lee: Are there any further questions or comments?

A Member: I would like to congratulate Mr. Wilson on a very good paper. It is so interesting to get some fundamental information once in a while.

If I understood Mr. Wilson correctly, the speed of wire drawing makes no difference to the temperature rise of the wire in the die. Therefore, the only problem is to cool the wire after it leaves one die and before it gets to the next one. If I have interpreted his paper correctly, then there is no reason why one day we cannot be drawing high carbon wire at 2000, 3000, 4000 feet a minute; it is just up to the people who design the machines to cool the wire between the blocks. Then we can go at any speed we want, is that correct?

Mr. Wilson: Yes, from what we can find out, the speed has no effect on the temperature rise in the die. The thought you expressed of going up to 2000, 3000, 4000 feet a minute I do not think is particularly a problem of cooling after it gets beyond a certain point. I think there are some mechanical difficulties that come in there in the wire machines. However, there is no doubt that there are ways available which we probably have not explored yet in which the wire can be cooled in order to be drawn at those high speeds. Don't ask me now what the ways are. What I would suggest I do not know. However, with the way we have gone so far we think it is in the cards to do that. But I am not going to ask you to hang by your thumbs until we do it.

Chairman Lee: Are there any further questions?

A Member: I also thought it was a very fine paper. There are a few questions in my mind. I think, first, the table on torques should have been maximum-minimum average. I believe that is an error on the table. The minimums were higher than the averages there.

Mr. Wilson: I think there was some error there. I did not draw the curves myself, and I neglected to check them.

A Member: Your indications are that you do get a slightly higher initial temperature with the faster speed. I think that is correct. I think if you could measure the skin effect it might be even greater. I think that is going to limit the speed in the high carbon wire drawing.

The third feature I was wondering about, we have a lot of Vaughn equipment. I was wondering if you had not minimized the effect of block cooling, because you do get effective cooling with the block between drafts.

Mr. Wilson: The first question about the coating, that is apt to obscure some of the results because of the insulation effect of the coating. There again that is something I cannot answer, as to whether it will limit drawing at higher speeds and cooling effectively. I think probably some work is to be done by the lubricant people there. I am not in a position to speak for them, nor do I intend to.

The next question you asked was in regard to—

A Member: The fact that a skin would affect the temperature of the wire coming right out of the die, which might be a limiting factor. That is something that is mighty difficult to measure.

Mr. Wilson: It is, because of that insulation effect that takes place between the thermocouple we were using—it just cuts down a little of the heat transfer. Just what the actual amount is I cannot say. However, it cannot be too much because certainly the results agree very carefully and closely with the theoretical.

Chairman Lee: Are there any other questions? If not, thank you, Mr. Wilson. (Applause)

Our next speaker recently received recognition in the Wire and Wire Products Magazine. Some of you no doubt will remember the article concerning a first prize award for a new packaging process called a Pay-Off Pack. William H. Richardson, Vice President of The Driscoll Wire Company, Shelton, Connecticut, is here to describe his process in his paper, "Continuous Wire Drawing and Packaging." (Applause)

Mr. Richardson presented his prepared paper. (Applause)

DISCUSSION

Chairman Lee: Are there some questions or comments on Mr. Richardson's paper?

A Member: What is the maximum speed any of these applications have been produced on?

Mr. Richardson: The maximum speed we have run is 2200 feet a minute. We are not now using 2200 feet a minute, simply because we have in our small plant only one machine capable of that. We are operating our loading units at a thousand feet a minute.

The reason for that is not because the system cannot be operated at high speeds. I am confident that it can be. However, our type of business is such that with the frequent changes we make, with the variety of sizes, finishes, tempers, and so on, the lower speeds seem to us to be more practical.

A Member: May I ask one more question then. At the 2200 feet per minute speed do you have any particular problem with the drums, the concentricity of the drums themselves, the fact that they might or might not get out of round in that type of revolving operation?

Mr. Richardson: We found that operating at those speeds it was necessary to support the drum from the top, and we did that. As you may remember, one of the slides illustrated three turnbuckles, rods, coming down from the drum extension to the chuck. Those turnbuckles in effect act as guy wires. When we put those three guy wires on we found we could rotate the drums at the highest speed of any machine we had without difficulty, even with the drum full of wire. Of course, the load is not particularly well balanced. The drums are very close to being concentric, of course. The fact that they are made at high speed on production machinery means that the drums must be very uniform. We have found that they have been.

A Member: You had no problems with the cores loosening up inside the drums?

Mr. Richardson: That is a physical matter of actual operation that fastens the core in the drum. The core is fastened by means of rivets or staples and glued. If there is a good stapling and gluing job done we have had no difficulty with that at all, the reason being that the wire, once again, is unstressed. The wire is not wound on that core at all.

A Member: What do you do about putting the different sizes in there when they don't want to lay, when they want to look like a crow's nest?

Mr. Richardson: We have had the same problem with running wire on blocks occasionally.

A Member: Not like that. I happen to have one of them.

Mr. Richardson: We have found that is a matter of cast and what we call pitch; that is, if the wire is properly killed it will lie in the drum. However, it is necessary, depending on the speed, to control the wander of the wire as it goes into the drum. That is the reason that we use those centrifugal fingers or flippers.

A Member: It seems to us that even though you set the cast and get it started from one given speed, if you change the speed from the first setting you also change the way it lies in the barrel, regardless of how the cast lies, due to the centrifugal force of the thing throwing it out.

Mr. Richardson: I can imagine that would be so. Our machines, of course, are such that when we start them they are operated at a given speed. They will come up to speed slowly but will run at a constant speed after that. We do not vary the speed up and down during the operation, so we have not found that to be a serious problem.

I will say this: that if the wire is not properly cast and killed, and we use a roll-casting device, the wire will be wild in the drum.

A Member: I realize that. However, you can cast certain sizes, especially the finer sizes, and I have seen them lie just the way they should coming off a block. But when you have some of the bigger sizes they just want to go all over. There is nothing to hold them. The finer wire seems to want to stay put a little better.

Mr. Richardson: When you speak of larger sizes what size did you have in

mind?

A Member: Around .072.

Mr. Richardson: That has not given us much trouble. I don't know why.

A Member: When it gets like that, of course, you cannot put anything in the barrel. You cannot get anything in the barrel to amount to anything.

Mr Richardson: That is right, you cannot get any weight.

A Member: A good share of the sizes seem to come that way regardless of how the cast is made. You can make the same diameter in the center portion between the cap and outside of the drum. You can make it so that it is exactly in the center an 18, 20-inch loop, and it still wants to go because there is room for it to go, room for it to chuck around.

Mr. Richardson: That is it; there is the possibility of the wire shuffling. Are you using the fingers?

A Member: We haven't tried that.

Mr. Richardson: That makes a tremendous difference.

A Member: By letting it drop in in bunches? Actually that is what happens.

Mr. Richardson: You accumulate a hank and then that drops. As I say, you can go too far with that and have some difficulties that way. However, without any question when that system is used, rather than merely putting the wire in, pouring it in, as you saw it done on the machine upstairs, perhaps—did you see that?

A Member: Mine is just like that one.

Mr. Richardson: That will operate well enough at lower speeds, but as soon as the speeds get up to a thousand feet or more it becomes necessary to install these fingers so that you will get a decent load in the drum. We call 500 pounds an acceptable loading. We do not load all the drums with 500 pounds because some people ask for less. I don't know exactly why, but some people do, probably because of unloading problems and that sort of thing.

However, we have no particular difficulty in going up to ⅛ and getting the 500-pound-plus load. I say no difficulty. We always have difficulty with everything. But it is reasonably predictable now that we can ship the 500-pound load.

A Member: There seems to be kind of a difference of opinion from our customers as to how they like it, depending on how it comes out of the barrel.

Mr. Richardson: That is very true. It is amazing to me the difference in adaptability, you might say, of customers to this method. We will put a sample drum, for instance, in one plant and the reaction will be, to use a favorite expression of mine, two words: "Im Possible!" We will put another sample somewhere else and they say, "Great! Nothing to it!" The differences are just as wide as that. Fortunately most people get onto it very quickly and easily.

We have such a small capacity, as you know, that we have not been able to go around and talk to all the people who might have been discouraged by the fact that they picked up the end of the wire, walked across the room with it and stuck it into a machine, without paying any attention to the proper method of pay-off. So I suppose there are people who are still in that unfortunate condition.

However, the ones who have given the matter some thought and were not too terrifically skeptical about it are using it day in and out, just as we are.

Chairman Lee: Are there any further questions?

A Member: You mentioned a finer size than .018. What is the finest size you have ever heard of?

Mr. Richardson: I have heard of .010.

A Member: In your dealings with these customers do you have any idea of the fastest speed with which they have taken wire out of these drums?

Mr. Richardson: Yes. For the most part the pay-off is in our industry relatively slow because we furnish wire principally to people who are making wire forms, let us say. However, that is not always true. I hesitate to make these statements sometimes because I don't know the exact speeds at which these operations have taken place, but let us say we had an operation where the wire was being kilned in a long spiral. The forward speed of that spiral, let us say, was like that (indicating) which means that a lot of wire is being payed out of the drum.

The only way we have of checking that is that we have attached the pay-out end of wire to a 2000-foot machine and run the wire out of the drum. So we have taken it out at something less than 2000 feet a minute, because we put one die on it in order to give us enough tension to work with it. Though the block is running at 2000 feet, it is not quite 2000 feet a minute. There is no trick at all in taking it out at a thousand feet.

I will qualify that. We have not done that with a heavier size range. I am speaking now of wire which might be .025 up to .040, let us say. In that range we have run it at very high speeds.

A Member: In putting wire in the size range of .040 to .018 or even .010 in the drums do you use the same size drum? You don't put a .010 wire in a 20-inch coil, do you?

Mr. Richardson: We do not differentiate. We use what we call the standard Pay-Off Pack. That is not necessarily going to continue forever. You mention coil size. We have an altogether different conception now of coil size. Ordinarily, thinking of conventional methods, it would be absurd to put .018 in 20-inch coils. However, with this pack it does not make any difference, apparently; it goes in just the same as though it were a larger diameter

We always thought of a certain range of sizes as being appropriate to a certain size block. That is no longer true.

Another thing that happened along those same lines is that when wire is payed out of this it of course seems to make no difference whether the wire is payed out in clockwise or counter-clockwise fashion. We no longer have the problem of standby equipment for the customer who wants clockwise wire and the customer who wants counter-clockwise wire, which of course was a headache as far as we were concerned. We would have machines standing there, clockwise or counter-clockwise machines, and no orders for them. But if we decided to get rid of them we would get orders. I think you have probably all had that same experience. This deal eliminates that, which is quite a useful thing.

A Member: The first question I would like to ask you is, what is the life of one of these drums within a plant?

Mr. Richardson: Within a plant? Well, there again I would have to do some guessing. It is surprisingly long. You mean just used as a process contained in the plant?

A Member: For process wire, that is right.

Mr. Richardson: This might illustrate it. We have certain operations where we are drawing a zinc coated wire and redrawing it. We will run it from the coil in which we procure it into a Pay-Off Pack. We then take the Pay-Off Pack and put it behind a continuous machine and run it down, let us say, eight holes into another Pay-Off Pack. In some cases we will put that one behind another machine and keep on going down with it.

The life of those drums as they kick around the mill is a matter of several months.

We discussed with Continental, our supplier—I know they have this in mind—of re-enforced drums which would be used primarily and particularly for processing operations. One of the things we must watch is when the drums are used in the wet wire department. If they are set on a wet floor it does not do them any good.

A Member: Have you any idea of the cost to the industry?

Mr. Richardson: The cost to the industry?

A Member: Of these drums per unit.

Mr. Richardson: They are somewhat under $4.00, a few cents under $4.00. Perhaps someone here can check me on that, give an exact figure. Perhaps Mr. Jones could answer that.

A Member: It is $3.28.

Mr. Richardson: That is the complete assembly, isn't that true?

A Member: Yes.

Mr. Richardson: Of course, this is more than a drum. It is an assembly, a structure.

A Member: In the old Leaver Pack many customers used to insist on a special winter liner for some of the special wet finish polishes. We had a problem shipping the material over the mountains, especially in the fall and spring, a corrosion problem. How do you take care of that? Do you put in some type of absorbent in your pack now?

Mr. Richardson: We have not as yet. We have always felt that if it became necessary, the structure was almost ideal to include a desiccant or one of the vapor corrosion inhibitors by placing it in the central core, let us say, perhaps piercing the core so that the vapor could reach through the load. However, we have not had enough difficulty to make that necessary.

I think there are several reasons for that. One is that, as I said before, the operator does not touch the wire. In the summertime, as we all know, no matter how many pairs of gloves the wire drawer is given, the gloves become

saturated with perspiration, his shirt and arms. I believe that is the principal cause of corrosion with highly finished wire.

The other reason I think we have had very little difficulty is that of course when the wire goes into the drum it is quite warm. In fact, it can be touched by hand but it is uncomfortably warm from our thousand-foot machines. When we ran at 1800 to 2000 feet the wire was actually hot.

We had no idea of what was going to happen. We thought there might be some disagreeable result such as condensation on the wire as it cooled off. However, we have not found that does happen. In fact, we have not as yet had one case of corrosion in wire. This of course is all steel wire, and I am speaking now of either bright or liquor finished or copper wire, and we have had not one case of corrosion since we started shipping the drums.

Chairman Lee: Are there any further questions or comments? If not, we want to thank Mr. Richardson. (Applause)

Another fairly new process in the wire industry is the cutting of carbide dies with electric current. H. V. Harding, Technical Assistant to the President of the Elox Corporation, Detroit, Michigan, is here to describe this method. (Applause)

Mr. Harding presented his prepared paper. (Applause)

DISCUSSION

Chairman Lee: Thank you Mr. Harding. We are now ready for your questions and comments.

A Member: Can you use this method in piercing diamonds?

Mr. Harding: Diamonds are pure crystalline carbon. Pure crystalline carbon is a good dielectric. We do not pierce diamonds with it, although by following the basic idea, the basic procedure and possibly using quite dangerous voltages we think we might be able to. We have not entered that field at all, sir.

A Member: You think it is a possibility, though?

Mr. Harding: I would not say there is no possibility. We sold a machine in Wisconsin, to follow your thought out, several months ago. The man, when he came to see us, said, Can you make a lamination die about the size of this tray here? We said we thought it would be just a bit beyond our machine. He bought it anyway and then sent us a lamination punched out by the die he made with the process. So I would not say it is impossible.

A Member: What micro-inch finish would you normally get on a finish pierce?

Mr. Harding: That of course is one of the first and one of the most important questions, the micro-inch finish. We have worked with many of the large companies, and also with Detroit Testing Laboratory. We have such a different finish that in terms of a micro-inch finish obtained by a brush profilometer it is a little misleading.

To answer you directly, on a standard cut, the head of the advanced engineering of Pratt and Whitney has written an article in one of the magazines where he is getting a 2, 2½, I think, micro-inch finish. Ordinarily you can expect about a 7, 8, 9 micro-inch finish with just a standard cut.

In speaking of micro-inch finish, when you go with a grind or with a lap you get a good reading. When you go across the scratches made by mechanical means you get a little poorer reading. You average it out and say that is the surface.

I think something of particular interest to wire-making men is the fact that now and again you get a deep scratch which does not register as part of the finish, and you have to work it out. You will get none of those deep scratches by this process. To bear my point out, Douglass Aircraft, Thompson Products, General Electric and several other companies using this process in grinding single-bit tools are finding that the fine surface does not do quite as good a job as a medium surface. They are getting greater tool life. It means that there is something else that goes on in the picture. I cannot and do not wish to go into the blue edge right now, but apparently with the type of surface we have, if you are drawing a wire and you have minute cavities, very minute that can be filled with the lubricant, you are sliding over the lubricant which is retained rather than rubbing against the smooth surface directionally with the grind or lap.

When you come to micro-inch finish, I will tell you directly the machines will give you an average of about 8, and you can go much less if you really want to.

A Member: Do I understand, then, that they are using the dies as pierced for drawing?

Mr. Harding: Yes. Experiments are being run now. Twelve were cut within the last two weeks in the central part of the country. However, I cannot give you the results.

A Member: How about blind holes?

Mr. Harding: Blind holes can be cut quite readily. You can make a cold heading die out of carbide. I speak of that because I think that is the metal most of you are using or will use. It doesn't make any difference what shape, but for example take a hex in a cold header die. There will be some brass wear, so you set the stop, shall we say, .005 from the ultimate distance. You will find slightly rounded corners on the tool. You dress the tool off square, put it back in on location, go down and pick out the corners, and you can get a very good corner. With the process you can also broach to a sharper corner than you can mechanically.

If you want the brass very fine—we have men who have honed brass and moved an inch or so in the brass through a hole, and they can broach it out to terrifically sharp corners.

A Member: In a blind hole such as that is there any difference in speed?

Mr. Harding: Of metal removal?

A Member: Metal removal for carbide versus cold heading steel?

Mr. Harding: I am glad you asked that question. The process was not brought out by us until we knew what we were doing in the way of repetitive work and metal removal. With the standard machine shown on the screen, if you care to remember these figures, you will get .003 cubic inches of steel per minute metal removal. In carbide there is a little less, .0025, with a single-power standard machine.

There is one point which has not been brought out here, something we have been discussing with wire men for some little time. That is this: We do not wish to overstate, but we do not think we are competitive. I have talked with Mr. Glen and others on this. I do not think we are competitive where you have a multiple spindle lapping machine on small holes for small wire. Where you use a single head for this process, I do not think it is quite competitive, where you come into something where you have to use a diamond wheel or any shape die; you can make any shape there is, no matter how intricate it is. Some dies have to be sectionalized, but no longer now do they have to be sectionalized mechanically.

We have found this: that due to the fact there is no electrolysis and due to the fact that there is no chipping action with an abrasive on there, the cobalt holds the particles to the very edge. That is one of the reasons why we are getting so much greater tool life, which should apply to die life.

A Member: I really enjoyed your paper, Mr. Harding. I am very interested in machinery for drawing dies. I presume you are familiar with the competitive methods of die shaping ultrasonically?

Mr. Harding: Yes, I am.

A Member: We have the Caviton machine and are making fairly extensive tests. We have one machine so far on intricate pinion shapes, cams, splines, and we are getting quite encouraging results.

We are having some difficulty in making our tool. Of course, it is a complicated tool. The wear on the tool is very important to us. You made a statement that with three tools you could finish up a trolley die, I believe?

Mr. Harding: Yes.

A Member: On manufacturing small pinions we use three or four. How would you consider your method of spark disintegration against the ultrasonic vibration in the wear of tools?

Mr. Harding: That is quite a question, sir, in a meeting like this. However, I think that ultrasonic machining has a wonderful place in the industry. I worked with Mr. Drysell of the National Bureau of Standards. For cutting the enamels, the hard plastics and the glass, ceramics in jet work there is an immense field, a terrific field. I think comparisons are sometimes odious; on the other hand, you have asked a question.

Flexibility of operation, as far as the Elox process is concerned, allows you to use any size tool within your imagination and the time you have to do it. I have in my hand one made last week by the Link Belt people. It is that rather odd shaped pin they use in the link belts. It was made with a little brass tool. They are on production with it. It comes from solid carbide, and the total operation takes 40 minutes. For sizing the wire it takes 12 minutes. I have been told verbally that they are coming within .2 or .3 to size. That is done with a single electrode.

I can speak of our process because I am the man who started this thing. I would like you to know we can do so many jobs that cannot be done, as I stated before, by an abrasive method

such as grinding. Every wire manufacturer will find applications for grinding, but when it comes to sinking deep dies, minimizing taper, making blind holes, and so on, I can only speak of our process.

I will ask you to make the direct comparison yourself, sir. I would be glad to work with you on that.

A Member: We have a considerable investment in the ultrasonic field. However, we are not doing the work in that field that I would like to talk to you about. I want to ask you, have you done some work in multiple opening dies in matching tools for the tool and die sets, where the overall work is on the order of an inch and a half in diameter but the openings in the die may be spaced around .050 or so on the edge, where there is a break-through problem?

Mr. Harding: I can answer you directly on that. The question is whether we break through thin walls. I think that is what you mean.

A Member: Yes.

Mr. Harding: We took a block of carboloy two weeks ago. We set up a brass wheel a half-inch wide. We set it down so that we would cut ⅝ of an inch in a single pass-through the block of carbide. We do not reciprocate back and forth. We push a button and it goes through the wheel, maintaining a space relationship at all times with the work never touching it. We cut a slot ⅝ of an inch deep and a half-inch wide through the block of carbide, and then raised the wheel and moved over, leaving a .015 wall. We went through and cut the second one. The wall remained intact. It was not damaged in any way. We did that until a bright man reached over and clicked it. He said, "By gosh, it is carbide, isn't it?"

A Member: We don't have to go to that extreme.

Mr. Harding: I might state that the Air Force sent in a non-restricted job, sent in samples. They were cut .003 between the holes.

A Member: I owe you an apology. I should have said these were mica fabrication dies.

Mr. Harding: I understand what the job is, sir, and I think we have done considerable work on it. We are under contract with several of the armed forces.

A Member: I was very interested in your talk. I noticed, of course, that all of the tools are straight feed through the die. How would you or how could you make a helix-type with the electrode turning?

Mr. Harding: That is a mechanical problem. We cut the metal. If the thing you have in mind lends itself to setting up mechanically—for instance, if you wanted to make a spiral through a block of carbide, provided the spiral was on a true pitch so it would follow through you can go in, and it has been done. You can go through the block of carbide providing you have the mechanical means of working it. The process will cut any metal known to man.

A Member: First of all I would like to thank you for a most interesting paper. I thoroughly enjoyed it. I don't know whether the question I have is in order. I may have missed a point at the beginning of the paper.

You said that your removal of carbide is .0025 cubic inches per minute. Now, if you were going to make a square hole in a die for drawing square wire, would there be any advantage in having a rough core, square hole? I imagine it would be relatively cheaper to make.

Mr. Harding: You are talking about a form of trepanning. I am glad you brought that up. So many points cannot be brought out in a short talk. That work is being done now where we are cutting out large holes by using a 1/16 wall tool and just dropping the slug out of the center. If you want to make a square hole in a die you can drill a round hole up through the electrode. The coolant comes down through it anyway. A pin will go through the center of the tool until you reach the bottom, and then the slug will drop out. That saves considerable time.

You do not need to calculate that pin in terms of cubic inches removed. That is free. It is only where the tool approaches the work that the cutting takes place. That is what you calculate.

A Member: Can you use the same brass pattern several times for making the same tool?

Mr. Harding: What we have done, sir, on repetitive cutting—I would like to clarify a point just brought up on the number of tools used. We have done some progressive or repetitive die work, for instance, where you use a rough cut to start with and then step to the next electrode which will give you a little finer cut, and then finish off with a fine one. You are actually using one electrode for the hole. You have thrown away the one eaten the worst then start with the next one on the next die. You always have a new one for the finish.

A Member: I think the question is half answered. I gather from the previous answer that you do not get much taper, is that right?

Mr. Harding: That is right, yes. Taper is inherent in the process.

A Member: I am speaking primarily of carbide sections for blanking dies, laminations, where normally they run ¾ of an inch to an inch thick, putting a form through that. Would you encounter any taper at all?

Mr. Harding: Yes. We would cut those from the back end so it would give draw to the slug, or give clearance to the slug. Normally with a straight cut through ¾ inch you would probably get .001 taper. We recently learned a new technique—there is so much to learn yet—where we take an electrode and deplate a portion of it, like a step drill or step reamer would be, regardless of the shape, just by deplating or etching off .002 or .003. You set it up and run it through fast and rough, undersize. Then when you come to the step sizing part of it you put it over to a very fine finish. You go down there and minimize the taper to the point where it is not discernible.

A Member: Perhaps this question has been answered. In finishing a die, the sizing hole has to be rather accurately finished.

Mr. Harding: Yes.

A Member: I think you said that you allow about .5 difference between the brass piece that makes the hole and the size of the hole. My question is, how accurately can you finish the size of the hole?

Mr. Harding: As to the finishing of a hole and the undersize of the electrode, a die maker will soon learn, regarding the piece of material he is working on, shall we say, to make the tool accordingly. When I said .5 I was speaking of an average cut. We are running jobs right now in Clawson, Michigan, just outside of Detroit, where we are using electrodes .1 undersize, 1.2 undersize. The distance between the tool and the work is a measure of the length of that control discharge. That is fixed, it is accurate.

A die maker can learn to come up to very close size in that respect by setting the size of the tool maybe .2 or .3 under, depending on the type of cut he is making. If it is a long cut he perhaps would want a little more clearance. He will go in a little undersize and then finish up to very close tolerances with another electrode. The important thing is that it is something that can be controlled.

A Member: Could you control it to, say, .1 or .2?

Mr. Harding: Yes. This little die from Link Belt they tell me is controlled to .2 to .3. They are running them on production right now.

There is another thing I did not mention. I do not want to digress too much, but I have not been asked the question as to whether or not we revolve any part of this. As you all know, by revolving you can get greater concentricity and accuracy. There has been a machine placed in one of the General Motors plants which works three ways. We adapt to any machine, it does not make any difference what it is; we put our process on any machine. The machine works three ways there where the table itself is under automatic feed for progressing across a job, where the quill moves up and down in a straight line, an axial movement without revolution, and where it can be revolved and do jig grinding.

There is something which should be of great interest to men of your calling, the jig grinding of dies. So far we have not gone into it very extensively. We have not had the time.

If any of you gentlemen are interested in seeing demonstrations of this, I would like to extend an invitation to you to see our plant here at any time. (Applause)

Chairman Lee: I believe by the interest shown in these three fine papers you have paid these gentlemen a compliment. You have been a very fine audience. Thank you.

. . . The session adjourned at 12:00 o'clock noon . . .

NON-FERROUS PAPER DISCUSSION TUESDAY MORNING SESSION

November 9, 1954

. . . The Non-Ferrous Section of The Wire Association convened in the Michigan Room of the Hotel Statler, Detroit, Michigan, at 9:30 o'clock a.m., Andrew Pudlak, Field Engineer, Copperweld Steel Company, Glassport, Pennsylvania, presiding. . . .

Mr. Flood: I would like to welcome

you all on behalf of our Association for another year. Before I introduce the chairman of the meeting, I would like to call your attention to a departure in the program this year. We have put two motion pictures in place of two technical papers. We hope that it is a welcome deviation, and that the motion pictures will be educational as well as enjoyable.

The first motion picture is one that has been produced by the Rome Cable Company, and I am sure from the reports that we have had regarding it that it will be very interesting.

The second is an all Kodachrome picture by the Canada Wire and Cable Company, and shows the processing of wire from mine to consumer.

Without wasting any more time, I would like to introduce Andy Pudlak, of Copperweld, the chairman of the meeting. (Applause)

Chairman Pudlak: I believe that my boss and most of the people that know me expected me to serve on some committee other than a technical committee, preferably an entertainment committee.

Yesterday we heard quite a discussion on the problems of wire drawing, and how to produce a good wire to be coded and handled beyond the wire mill stage. Dr. J. A. Loritsch, of Alkyd Products Engineering, Chemical Materials Division, General Electric Company, will start the session off this morning with his paper: "A Study of the Solvent Resistance of Formvar Enameled Wire." Dr. Loritsch. (Applause)

. . . Whereupon Dr. J. A. Loritsch presented his paper. . . .

DISCUSSION

Chairman Pudlak: Dr. Loritsch's paper will be open for discussion. Since this is a small room, we would like to have you get up and announce yourself, the name of your company, and direct your question to Dr. Loritsch. Are there any questions in the audience?

A Member: Is there any correlation between the methanol extractables and the ability to tin coat the ends of a formvar insulated wire by dipping?

Dr. Loritsch: I don't believe so. I believe that in either case, except for the very large wires, formvar must be taken off either chemically or by vibration.

A Member: Do I understand correctly that tin dipping is not a particularly good way of doing this?

Dr. Loritsch: I would say that from my observations, in most cases it is removed either chemically or by vibration.

A Member: Is the General Electric Company using the free film method?

Dr. Loritsch: Yes, we are, but only as a supporting tool at this particular time. We believe we need more experience with the free film technique before we would switch to it as a sole control.

A Member: Do you use the Soxhlet method completely on these evaluations?

Dr. Loritsch: We use the Soxhlet method completely as the sole control.

A Member: What do you mean by the phenol isomer ratio?

Dr. Loritsch: Well when you speak of phenols, you usually imply more than one chemical structure. We mean the distribution between, say, xylenols, creasols, and straight phenols.

A Member: Do you classify xylenols and such as phenols?

Dr. Loritsch: In our ordinary laboratory vernacular, we do. When we talk of phenols, we include all these structures. It may be untrue laboratory vernacular, but we understand each other.

A Member: I noticed on one of your slides that you said the increased wire feed increased your solvent resistance. Then, later on, you mentioned that you kept the same oven temperatures in your test. You didn't in that particular instance, did you?

Dr. Loritsch: We vary each variable while keeping it as constant, in order to get its effect on extractables. So we examine a number of variables, and wire speed happened to be one of them. Wire temperature was another.

A Member: Have you had any experience with increased speed and increased temperature, trying to get about the same flexibility of film? Does that improve your extractables?

If you had a wire testing approximately the same in all respects except solvent resistance, and you gained that wire with different speeds, would you expect different solvent resistance on it?

Dr. Loritsch: In other words, you are asking me: If you had established a bench mark for a given enamel at a given speed and given oven temperature, and then you varied what?

A Member: What I am getting at, we make wire to a certain set of specifications of flexibility and adhesion. If you had a wire that passed all of those tests, but you gained that wire at 17 feet a minute or you gained it at 23 feet a minute—of course you'd have different baking temperatures — would you expect a different solvent resistance to freon or methanol because of the higher speed?

Dr. Loritsch: Yes, I would.

A Member: At the higher speeds and higher temperatures, you would get less extractables?

Dr. Loritsch: I believe our slide shows that the temperature has a greater effect on the speed. So that in answer to your question, my judgment would be yes, you'd get less extractables.

A Member: In the extractable test there, do you use the same weight of free film each time?

Dr. Loritsch: Yes.

A Member: What is the film thickness on your free film method?

Dr. Loritsch: We can get down as low as two mils if we wish. We have picked three or four, because it happens to be convenient for our technique.

A Member: Would it also have quite an effect on the amount of extractables?

Dr. Loritsch: We have attempted to correlate the baking time of the free film with the performance of the enamel on wire. This one hour at 185 degrees centigrade that I mentioned as being our choice at the moment is very close to equivalent conditions—at least we get parallel results. We haven't got a curve yet superimposed.

A Member: I meant, have you tried to correlate the film thickness against the amount extracted?

Dr. Loritsch: No, Jim, we haven't. My thinking is that we could, by controlling the time and temperature of cure, arrive at any bench mark we wish, so long as we correlate it with the performance on wire.

A Member: In connection with this question, have you measured actually the film thickness, top and bottom of your film?

Dr. Loritsch: Yes, we have. It is quite uniform.

A Member: That would make quite a difference in cure if it was not uniform?

Dr. Loritsch: Very true.

A Member: Would it perhaps influence the extractable?

Dr. Loritsch: We have about a one-tenth mil variation from top to bottom in the space of ten inches.

A Member: Are these additives patentable?

Dr. Loritsch: Patents are pending on the use of additives.

A Member: One other question. Do these additives reduce the resistance of freon?

Dr. Loritsch: I think I can answer that this way. Perhaps you can interpret it for your own results. Use of additives will reduce the freon extractables about 25 per cent over what they are without additives.

I might say that all these additives don't give you the same effect on extractables. For example, hexa methylene tetramine actually raises the extractables.

A Member: Are any of these enamels with the additives now in commercial production?

Dr. Loritsch: Yes sir.

A Member: What effect do the better additives have on the abrasive characteristics, first, and also on the voltage deterioration characteristics. secondly? That is, over a period of shelf aging?

Dr. Loritsch: We have found that the additives have no influence on either one of those characteristics. We have on occasion noticed that we will get effects on abrasion and perhaps on heating, but this has to be examined before you dare use them, of course.

A Member: Better or worse?

Dr. Loritsch: In both cases, worse; but still within the usual mean specifications for wire. Not all the additives give you the same effect, so I say you have to choose carefully which ones you use.

A Member: What per cent of extractable materials is obtained using formvar enamel?

Dr. Loritsch: When properly baked, either two to three per cent by either the toluene or methanol tests.

A Member: On your additives when you add them in varying proportions to your formvar, does it improve the resistance to these explosion bubbles on an explosion or a hot test—blister test—in freon?

Dr. Loritsch: No it doesn't.

A Member: Does it decrease flexibility and adhesion to the copper?

Dr. Loritsch: It does not decrease adhesion. As I indicated, some of the ad-

(*Please turn to page* 103)

The Silver Anniversary Convention of The Wire Association

by Edmund D. Sickels, Editor
Wire and Wire Products,
Stamford, Connecticut

This year's Annual Convention at Detroit, Michigan, running from November 8th through the 11th, 1954, was a great success from every point of view.

★ ★ ★

The morning of November 8th was devoted to registration and

The Annual Meeting of the Board of Directors

The Board was called to order at 10 o'clock for their regular semi-annual meeting by President Crewe.

★ ★ ★

The minutes of the previous meeting were read by the Executive Secretary, **Richard E. Brown.** As Treasurer, he also read the Treasurer's report, which showed in the auditor's statement a cash balance as of September 30th of $1958.79. Both reports were approved as presented.

★ ★ ★

Mr. Crewe then called on the chairmen of the several association meetings held in 1954 to report on these activities.

★ ★ ★

Raymond S. Worth and **Frank R. Nichols** were seated at this meeting as new Directors and welcomed. They replaced two retiring directors: **D. M. Schmid** and **Uno V. Johnson.** Other directors re-elected were **Fred M. Crapo, Tom M. Girdler, Jr., Grayson B. Wood, Jr.** and **Richard E. Brown.**

★ ★ ★

The members of the Nominating Committee appointed to serve in 1955 are **Richard E. Brown, Fred M. Crapo, Tom M. Girdler, Jr., Frank R. Nichols, Grayson B. Wood, Jr.** and **Raymond S. Worth.**

★ ★ ★

Officers nominated and elected for the coming year were: President, **Leslie C. Whitney;** Vice President, Ferrous Division, **Clem L. McGowan;** Vice President, Non-Ferrous Division, **Ralph B. Roth;** Executive Secretary and Treasurer, **Richard E. Brown.**

★ ★ ★

Leonard C. Crewe, as the retiring President, was appointed Chairman of the Board of Past Presidents, whose job it is to select the Mordica Memorial Lecturer for the coming year.

★ ★ ★

The Executive Committee, appointed to serve next year, consisted of **Leslie C. Whitney,** Chairman, and **John L. Sanderson, Ralph B. Roth, Benoit J. Sirois** and **Richard E. Brown,** ex-officio member. The Directors approved a motion to replace two members of this committee with two new men each year.

★ ★ ★

The Membership Committee, members of which were re-appointed by Mr. Crewe, are **Sidney Rolle,** Chairman, **Uno V. Johnson, D. D. Buchanan, James E. Flood** and **Richard E. Brown.**

★ ★ ★

The Medal Award Committee was also re-appointed by Mr. Crewe. They are **Allan B. Dove,** Chairman, **Dartrey Lewis, Bruce W. Gonser, William L. Wells** and **David M. Schmid.**

★ ★ ★

The Board voted to select **John Moritz, Jr.,** President, **Standard Industrial Compounds Co.,** Chicago, as General Program Chairman for the coming Convention in Chicago. **Stewart S. Gray,** Asst. Vice Pres., **Union Wire Rope Corp.,** Kansas City, will serve as Chairman of the Ferrous Section and **Benoit J. Sirois,** Met. Eng., **Phelps Dodge Copper Products Corp.,** Elizabeth, N. J., will serve as Chairman of the Non-Ferrous Section.

★ ★ ★

David M. Schmid, who is Chairman of the Eastern Regional Meeting, to be held April 28th and 29th in New York City, presented a very complete report on plans, which are well developed. The program was approved.

★ ★ ★

The holding of a Regional meeting in the early part of June in San Francisco was authorized. Mr. Brown was authorized to explore the possibility of securing a San Francisco man to serve as Program Chairman.

★ ★ ★

The Board approved the holding of the 1955 Annual Convention in Chicago at the La Salle Hotel, November 14th through the 17th.

★ ★ ★

Approval of the William Penn Hotel, Pittsburgh, October 29th to November 1st, as the place and time for the 1956 Convention was authorized.

★ ★ ★

Because of the difficulty this year arising from papers being received too late for pre-printing in the Convention Issue, the program chairmen were requested to brief authors more carefully on this point at the time they are approached for papers, so that fewer delays will be experienced in the future.

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The Board also discussed the cost of conducting meetings, as a result of which it was decided to continue the differential in the registration fee between members and non-members and to continue to include in the registration fee the cost of the Annual Luncheon.

A vote of thanks was recorded to the members of the 1954 Regional Program Committees for the meetings held in Worcester, Mass., on April 22nd and 23rd and in Los Angeles, Cal., on June 11th, as well as to the committees handling the Annual Convention in Detroit, whose names were recorded earlier in this account.

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A consideration of the cost of the Smoker-Dinner show resulted in the conclusion that as the cost of these shows have been slowly but steadily rising, it would be necessary to pare this expense materially.

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The results of the membership ballot on the two By-Laws revisions were given and a majority of the directors voted their approval of them at this meeting.

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Mr. Girdler moved that the acts of officers and directors in 1954 be ratified and approved. This was done and was followed by a rising vote of thanks to Mr. Crewe for his fine work as president.

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A discussion was held of possible future By-Laws revisions that would enable the Association to operate on a broader scope, after which, the meeting was adjourned.

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This was followed by a pleasing luncheon given by the Board each year to the program participants.

Monday Afternoon, November 8th

The serious business of the Convention got under way at 2 P.M., with **John H. Richards** of **Apex Alkali Products Company** presiding at the opening joint technical session of the Ferrous and Non-Ferrous Divisions of the Association.

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Mr. Richards first introduced **President Leonard C. Crewe,** who welcomed members and guests to the Silver Anniversary Convention and especially those who had come from abroad to be with us. Countries represented were England, Belgium, Australia, Austria, Mexico and Canada.

The first technical feature was a Symposium on Wire Drawing Lubricants, the panel members each presenting a paper on a different phase of wire lubrication. The speakers were **Dr. Gray Verner,** Technical Director, **Standard Industrial Compounds Company; Leon Salz,** Manager, Lubricants Division, **Magnus Chemical Company** and **Jerome B. Bean,** Wire Lubricants Division, **Apex Alkali Products Company.** With wet and dry lubricants for ferrous and nonferrous wires covered, their presentations resulted in many questions from the floor, all of which were answered. The Symposium papers and the discussions are published in the January 1955 issue of Wire and Wire Products.

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The second feature of the joint session was a paper, "Quality Control in the Wire Industry", by **Axel U. Sternlof,** Division Product Engineer, Electrical Cable Works, **American Steel and Wire Division, United States Steel Corporation.** Mr. Sternlof's ably presented paper discussed control limit calculations and a modified method, compared with a new method found successful in meeting job-shop quality control conditions.

Tuesday Morning, November 9th

The morning Ferrous Section Meeting was in charge of **H. Clark Smith,** Supt., Heavy Wire Div., **Wilbur B. Driver Company.** He introduced the several speakers, whose subjects and names are as follows:

"The Effects of Coiling Temperatures of Hot Rolled Rods," discussing temperature of rods at finishing and the direct bearing on scale and the problem of removing it, by **Robert A. Stebbins,** Asst., Supt. Rod & Wire Div., **Bethlehem Steel Co.,** Johnstown, Pa.

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"Processing of Wire Products in Salt Bath Furnace," a review of annealing and cleaning operations in salt bath furnaces, with data on time cycle, by **Leon B. Rosseau,** Vice Pres., **Ajax Electric Company,** Philadelphia, Pa.

"Continuous Patenting, Cleaning and Coating of Steel Wire," in which was given a rope manufacturer's point of view on the processing of wire to achieve uniform quality, by **Donald K. White,** Foreman #2 Wire Mill, **John A. Roebling's Sons Corp.,** Trenton, N. J.

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Concurrently with this, the Non-Ferrous Section, with **Andrew Pudlak,** Field Engineer, **Copperweld Steel Company,** serving as Chairman, heard three papers. These were:

"A Study of the Solvent Resistance of Formvar Enameled Wire," a discussion on this magnet wire coating, by **Dr. J. A. Loritsch,** Mgr., Alkyd Products Eng., Chemical Materials Div., **General Electric Co.,** Schenectady, N. Y.

★ ★ ★

"Electrotinning Copper Wire from the Stannous Fluoborate Bath", a description of a widely used process for tin coating copper wire for conductors, by **Dr. A. E. Carlson,** Engineering Service, **General Chemical Div., Allied Chemical & Dye Corp.,** Edgewater, N. J.

★ ★ ★

"Composite Wires by Electroplating," a discussion of composite metals and the manufacture of composite wires, by **Edward G. Slick,** Supervising Engineer, **Sylvania Electric Products,** Warren, Pa.

Tuesday Afternoon, November 9th

In the afternoon, the Ferrous Section, with **Frederick W. Leslie,** Supt., **G. F. Wright Steel and Wire Co.,** in the chair, three papers were given. They were:

"Prestressing Wires-Stress-Relaxation and Stress-Corrosion Up to Date," giving the latest information and importance of protection against corrosion by **Gordon T. Spare,** Research Project Engineer, **American Steel & Wire Div., United States Steel Corp.,** Cleveland, Ohio.

★ ★ ★

"Phosphate Coating of Steel Wire," telling how phosphate coatings function, and describing their advantages, by **James S. Le-**

land, Engineer, **Parker Rust Proof Company,** Detroit, Michigan.

★ ★ ★

"Acid Cleaning of Stainless Steel," in which was discussed the fundamentals in make-up of oxidized surfaces on stainless steels and various cleaning practices used in the industry, by **John H. Corson,** Director of the Laboratory, **Carpenter Steel Company,** Reading, Pa.

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At the same time, with **Glenn J. Moher,** Manager of Methods, Wire and Cable Section, **Canadian General Electric Co., Ltd.,** serving as Chairman of the Meeting, the group heard two papers as follows:

"Rigid and Semi-Rigid PVC Insulations," in which the properties of these materials and their applications to electric conductors, based on recent laboratory developments, were discussed by **J. L. Foster,** Products Engineer, Plastic Materials, **B. F. Goodrich Chemical Co.,** Cleveland, Ohio.

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"Some Controversial Points on Dry Blending," a paper holding that dry blending is more than formulating ingredients. Matters to be considered and critical problems of blending were discussed by **Milton S. Greenhalgh,** Superv., Thermoplastic Insulation Unit, C. M. Laboratory, **General Electric Co.,** Bridgeport, Conn.

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The showing of a top-notch color motion picture through the courtesy of the **Rome Cable Corporation,** "Cable Pathway to Power," concluded this session. An exceptionally fine picture!

Wednesday Morning, November 10th

The Ferrous Section meeting was presided over by **Glenn R. Lee,** Wire Mill Supt., **Continental Steel Corporation,** who introduced the subjects and speakers. These were:

"Cooling of Steel Wire in Continuous Drawing," a report on the investigation of the effect of air volume and finishing speed on wire temperature rise and physical property, by **Norman A. Wilson,** Asst. Director of Research, **Morgan Construction Company,** Worcester, Mass.

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"Continuous Wire Drawing and Packaging," which tells how this new process has expanded beyond original concepts. Principles were explained and new fields of application outlined, by **William H. Richardson,** Vice Pres., **The Driscoll Wire Co.,** Shelton, Conn.

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"Making Shaped Dies by the Electrical Discharge Process," in which the process was described and samples of dies made by this and conventional methods were exhibited, by **H. V. Harding,** Tech. Asst. to Pres., **Elox Corp. of Michigan,** Detroit, Michigan.

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Grayson B. Wood, Jr. Mill Product Engineer, **Scovill Manufacturing Company,** presided at Non-Ferrous Section meeting. He introduced the speaker, **Phillip J. Croft,** Chief Engineer, **Canada Wire and Cable Co., Ltd.,** who talked on "The Application of Wire and Cable to a Wire and Cable Plant," a paper dealing with the peculiarities of wire and cable power loads, drives, etc., as they affect the choice of wire and cable feeding the various types of mill machinery.

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The meeting concluded with the showing of two excellent sound-color films: "Copper, Mined to Finished Products" and "Sinews of Industry." The first was concerned primarily with **Noranda Mines, Ltd.** and secondarily with **Canada Wire and Cable's** Operations. The second was devoted entirely to the details of the latter company's manufacturing operations.

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These morning meetings wound up the technical sessions of this Convention.

The Annual Luncheon

Always colorful, this affair was attended by approximately five hundred men and women. When the luncheon was over President Crewe took the rostrum, and after welcoming the assemblage, introduced those who sat at the Speakers' table, each of whom responded graciously. These included **Charles P. Rigby** (who will wind the Association's English Clock), **Clem L. McGowan, Leslie C. Whitney** (the newly elected president), **Earle Glen, Richard E. Brown, Allan B. Dove** (chairman of the Medal Award Committee), **Carl E. Johnson** (Mordica Memorial Lecturer) and **Vito J. Vitelli** (1953 Medal Award recipient). Mr. Dove made the medal presentation, after first explaining how the Oxford System works in making such selections. This coveted award went to **Vito J. Vitelli,** Process Engineer, Metallurgical Engineering Dept., Steel Wire Mills Div., **John A. Roebling's Sons Corp.,** Trenton, N. J., for the most meritorious paper—"The Drawing of Shaped Steel Wire."

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Mr. Whitney presented a Certificate of Honorable Mention for the best ferrous paper in 1953 to **Dr. F. R. Morral,** Head, X-Ray Dept., Div. of Metallurgical Research, **Kaiser Aluminum and Chemical Corp.,** Spokane, Wash., and **Dr. F. A. Schaufelberger, Chemical Construction Corp.,** New York, N. Y., for the best ferrous paper—"Molten Salts for The Wire Industry," which they had prepared jointly.

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Ralph B. Roth, the Association's Non-Ferrous Division Vice President, then was called upon to present Certificates of Honorable Mention for the best non-ferrous paper in 1953 to **F. W. Wurtzell, W. J. Canavan** and **B. H. Maddock,** Development Engineers, **Bakelite Company,** New York, for the best non-ferrous paper—"A Review of Fluorothene in the Wire and Cable Industry." These three gentlemen were its co-authors.

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Thereupon, Mr. Crewe moved on to a most important piece of business, one of the high-lights of the post-luncheon activities—the presentation of appropriately inscribed certificates honoring and recognizing those who had been members of the Association for

Leonard C. Crewe, Jr., president of the Wire Association presenting 25 Year Silver Anniversary Certificate to Fred M. Crapo, president, Indiana Steel & Wire Co., Kokomo, Indiana and chairman of the board of past presidents of the Wire Association. * * * * * * *

"At Speakers Table—Left to Right"

Richard E. Brown The Wire Association	Executive Secretary
A. Earle Glen Carboloy Dept. Gen. Elec. Co. Detroit, Mich.	General Chairman 1954 Convention
Vito J. Vitelli John A. Roebling's Sons Corp. Trenton, N. J.	Medal Award Winner for 1953
Allan B. Dove Steel Co. of Canada Ltd. Hamilton, Ont., Canada	Chairman Medal Award Committee
Fred M. Crapo Indiana Steel & Wire Co. Kokomo, Indiana	Chairman—Board of Past Presidents
L. C. Crewe, Jr. Maryland Fine Wire & Specialty Co. Cockeysville, Maryland	President The Wire Association
Carl E. Johnson Bethlehem Steel Co. Sparrows Point, Md.	Mordica Memorial Lecturer
Leslie C. Whitney Copperweld Steel Co. Glassport, Pa.	V. P. & President Elect for 1954 of W. A.
Ralph B. Roth Ludlow-Saylor Wire Cloth Co. St. Louis, Mo.	V. P. The Wire Association
Major Charles Patrick Rigby John Rigby & Sons Ltd. Manchester, England	Official Winder of The Presentation Clock for 1954
C. L. McGowan Atlantic Steel Company Atlanta, Ga.	V. P. Ferrous Div. of The Wire Association

Allan B. Dove, plant manager, Steel Co. of Canada Ltd., Hamilton, Ontario, Canada. Chairman Medal Award Committee for 1953 Awards presenting the Wire Association Certificate of the Medal Award for 1953 to Vito J. Vitelli, process engineer, Steel Wire Mill, John A. Roebling's Sons Co., Trenton, N. J. * * * * *

L. C. Crewe, Jr., President, Maryland Fine Wire & Specialty Co., Cockeysville, Maryland. President of the Wire Association presenting 1954 Mordica Memorial Lecture Certificate to Carl E. Johnson, Supt., Rod & Wire Mills, Bethlehem Steel Company, Sparrows Point, Maryland. * * * * * * *

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twenty-five years. After awarding such a certificate to **Fred M. Crapo,** Mr. Crapo took the rostrum, preceding the ceremony by saying:

Members of The Wire Association and guests:

Certainly, it is a privilege for which I am grateful, to make these presentations today which recognize and honor those of our originl members who have been with us since the Association's inception.

Some twenty-five years ago, a small group of wire men met in Buffalo with an idea. That idea was that production men could greatly help one another and advance the interests of their industry through an organized plan of exchanging information on methods and processes in the manufacture of wire.

Today, you will hear from others of many of the interesting things that transpired in those early days, which will recall that twenty-five years ago there still existed a great deal of rule-of-thumb practice in the art of wire drawing. The organization of The Wire Association marks the beginning of its emergence from a skilled handicraft to a scientific approach.

The introduction of the tungsten carbide die coincided with our early history. Metallurgy was just coming into its own. Continuous machines and processes were being introduced. Rigid specifications and precision manufacture were beginning to be thought about.

We still have with us a small group of men who joined with us in the effort to promote better practices within the industry. It is a great pleasure to recognize those persons who have been with the Association continuously through this history-making quarter-of-a-century by presenting to them certificates memorializing their cooperation, support and dedicated efforts to promote the best interests of the wire industry. Through their loyalty and hard work a firm foundation for our present success was laid.

You who are receiving these certificates have played vital roles in the development of the industry, not only in your own plants, but in others through the influence of the Association.

So it is in grateful acknowledgment of your fine service that the Association presents these certificates to you, for each certificate carries with it the personal appreciation of today's directors and officers for all that you have done for us and our industry.

I wish to request that any applause be withheld until the completion of these presentations.

Will you please come forward as you are called?'"

The men so honored were:

DENIS W. ALDRIDGE
P. ALDEN BEAMAN
RICHARD E. BROWN
COL. FRANK W. BULLOCK, U.S.A. (Ret.)
RALPH K. CLIFFORD
JOHN C. COPPICK

FRED M. CRAPO
ANTHONY FOUKAL
ROSWELL L. HAMAKER
SAMUEL J. HAMMITT
ADDISON E. HOLTON
WILFRED A. HUGHES
LLEWELLYN W. JONES
WILLIAM F. KNOLL
ROBERT H. LEACH
JAMES R. LONGWELL
I. CAMERON MACKIE
CLEM L. McGOWAN
WALTER A. RICHARDS
JORGE A. RIVIERE
DANIEL P. SOMMER
RUTH S. SPENGEL
F. PALIN SPRUANCE, Sr.
CHARLES F. VAN HOOK
LEE A. VAUGHN
LESLIE C. WHITNEY
ROBERT B. WHYTE

★ ★ ★

Following these presentations, Mr. Crewe introduced **Carl E. Johnson,** Superintendent, Rod and Wire Mills, **Bethlehem Steel Company,** Sparrows Point, Maryland, upon whom had fallen for 1954 the highest honor within the power of the Directors to bestow—the invitation to serve as our Mordica Memorial Lecturer. Carl lived up to expectations in his delivery of the lecture, "The Jack Mordica Story," which this year very appropriately delineated the work and character of **John Mordica,** perhaps the most potent spirit in getting the Association organized and under way in its early days and its perennial president until his death in 1937. The lecture was highly inspirational, held the interest of the group to its end.

The Annual Meeting of Members

At 4:00 P.M. Mr. Crewe called the Annual Meeting of the members of the Association to order. After the reading of the Minutes of the last meeting by Executive Secretary Brown and hearing the report of the Treasurer, Mr. Brown, both of which were adopted as read, Mr. Crewe turned the presiding officer's gavel over to the new President, **Leslie C. Whitney.**

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The new officers and directors previously elected by letter ballot were announced and those who were appointed at the Directors Meeting on Monday to serve on the several Association Committees for the coming year given.

Announcements were then made of the meetings authorized by the Directors for 1955.

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A motion to spread upon the Minutes an expression of appreciation to Mr. Crewe for his excellent work as President during the two preceding years was unanimously approved.

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Another motion to ratify the actions of the Directors for the previous year was made and adopted.

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Under the heading of new business, ways and means of improving the quality and quantity of the Association's papers for non-ferrous members were discussed, to the end of improving the attendance of these men. These suggestions will be taken under advisement for future meetings.

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There being no further business, the meeting was adjourned at 4:30 P.M.

The Stag Smoker Dinner

Four hundred and forty Association members and guests attended this convivial Convention feature held in the Grand Ball Room of the Statler Hotel.

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The Wayne Room, just off the Ball Room, was opened at six o'clock for cocktails and it was crowded to capacity until the doors were opened for dinner at 7:15 P.M. Every seat appeared to be occupied.

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Following the efficiently served and excellent dinner, **Eber J. Hubbard, Jr.,** Chairman of the Entertainment Committee opened the show that has become a traditional part of the Convention's doings. It was a good show, too, with a long series of high-calibre acts doing their stuff under the skilled guidance of an M. C., who, himself, proved to be a good actor—especially skilled in juggling.

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The enthusiastic applause that followed each act was indicative of a high degree of appreciation, including some in which there was audience participation, again proving that wire men are endowed with many talents.

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Our thanks once more to you, Eber, for providing us with another excellent show.

Thursday, November 11th
The Plant Inspection Tours

This last day of the Convention was devoted entirely to two plant inspection trips.

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Busses left the Statler Hotel promptly at 9:00 A.M. for a tour of the carbide and carbide product manufacturing facilities of the **Carboloy Department** of the **General Electric Company** on East 8 Mile Road in Detroit.

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Visitors were divided into small groups, each with a guide, who steered them through the extensive plant, seeing first the carbide powder manufacturing processes, the pressing and sintering of carbide tools, wear parts and dies, and then following the progressive flow of these products through their various stages of manufacture of finished cased dies and tools to the stock and shipping rooms.

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Product checking stations, the laboratory and the many points along the way by which Carboloy is able to assure uniformity of products and control of quality were noted with great interest. The impression was one of a highly organized, highly efficient and highly productive series of smooth-flowing operations.

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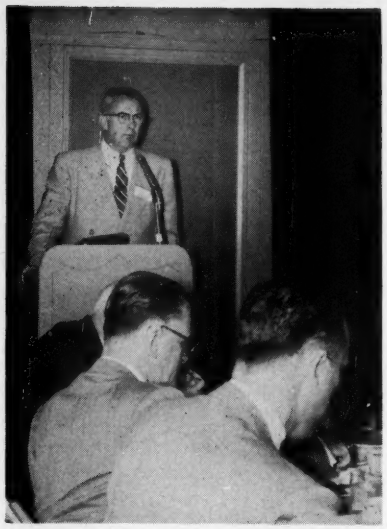
This tour lasted approximately an hour and a half, after which Carboloy's guests were ushered into a tastefully decorated dining room, at the doorway of which was a large "birthday" welcome cake. After the luncheon, **Earle Glen,** our host for the day, introduced **Kenneth R. Beardslee,** General Manager of the Carboloy Department. Mr. Beardslee said—

"Thank you, Mr. Glen. Many have already welcomed you to Carboloy and again I can only state that we really mean it! You have listened to papers all week and also you production men have been influenced by over-enthusiastic salesmen; so just relax—I'm not going



K. R. Beardslee, general manager, Carboloy Department of General Electric Company, Detroit, addressing visitors of the Wire Association, who lunched at the Carboloy plant during a scheduled tour at the close of the Wire Association national convention in Detroit, Nov. 11.

to make a speech.

"The wire industry is close to my heart. Last year was the 25th anniversary of Carboloy and this year marks the 25th anniversary of The Wire Association. Much water has gone over the dam since such stalwart and rugged individualists as John Mordica, George Paff, Ken Lewis and others formed the Wire Association 25 years ago. Much credit goes to Dick Brown for his early financial support and guidance.

"Conventions in the early 30's were certainly far different from the facilities and entertainment that goes on today. Twenty-five years has produced much progress in American industry—so it has been with the wire, bar, tube and cold heading industry. Those of us who have been associated in the carbide industry are proud of the part carbide dies played in faster drawing speeds, better finishes and physicals and no doubt the start, many years ago, of a more advanced technology in your industry.

"With this advancement we are proud that an R-5 die that used to be sold for ripping rods in the early 30's at $23.80 is now replaced by an R-2 die doing the same job, which you buy in the core state at $1.75.

"We're happy today that you have taken the time to see our facilities and our people at work. We are very proud of our people. You think of Detroit as the heart of the automotive industry and it certainly affects the end-use of many of your wire and steel products. Although this plant is on a much smaller scale, it has been in the past and will be more important in the future as our American economy advances.

"My associates and I at Carboloy, and I am sure I speak for the entire carbide industry, look at small pieces of cemented carbides as the vitamin of American industry.

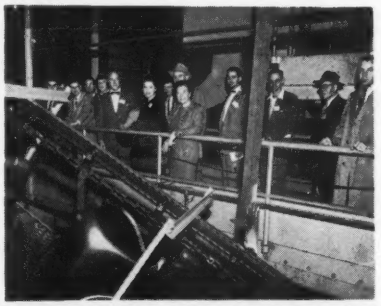
"The Wire Association has honored Earle Glen, who has been General Chairman this week, and we at Carboloy are proud of him. You have honored us by being here today and we are deeply appreciative and hope that you enjoy your afternoon at the Ford Motor Company. Thank you."

* * *

Busses left Carboloy about 1:00 P.M. for Dearborn, where visitors alighted at the **Ford Motor Company's** new Rotunda Building. This lovely building houses displays and exhibits arrayed about its four quarters. These included, besides current models, full sized test models of cars of the future, exhibits illustrating basic and applied research in the fields of chemistry and electronics, exhibits of manufacturing processes and scientific quality control, and some pertaining to research and engineering in the automotive industry.

* * *

From there, busses transported guests to Ford's mile-long steel mill, in which, starting with the soaking pits for heating blooms, the numerous operations in which these are rolled into sheet, pickled, cut, stamped into doors, fenders, bodies, etc., and welded into assemblies ready for painting, were seen.



Group of Wire Association visitors in the Ford Motor Company's stamping plant after they had toured the steel mill. * * * * *

The proportions of these Ford operations almost stagger the imagination and it is an education in itself to follow them through the huge plant. In the Rouge plant, an industrial city in itself, covering some 1200 acres of land, more than 63,000 men and women work for approximately a million and a quarter dollars a day to turn out Ford cars for our eager public.

* * *

The Association is grateful to the **Ford Motor Company** for the many courtesies shown on this tour to its members.

(*Please turn to page* 101)

A. E. Glen, manager of die and wear part sales, Carboloy Department of General Electric Company, and general chairman of The Wire Association program committee, points out the finish on a wire roll to Wire Association members in the Carboloy plant. * * * * * * *

Here, A. Woodcroft, supervisor of shipping and stockkeeping, Carboloy Department of General Electric Company, Detroit, briefs Wire Association members touring the Carboloy plant on the variety of cemented carbide tools and parts handled through shipping. * * * * * * *

SCHEDULE #1

THE WIRE ASSOCIATION

STATEMENT OF CASH RECEIPTS AND DISBURSEMENTS

FOR THE PERIOD APRIL 1, 1954 TO SEPTEMBER 30, 1954

CASH ON HAND = April 1, 1954			$ 2,119.98
CASH RECEIPTS:			
Dues:			
488 Individual Memberships @ $15.00		$ 7,320.00	
6 Company Memberships (48 individuals) @ $100.00		600.00	
Total Income from Dues		$ 7,920.00	
Worcester Regional Meeting Income:			
Return of funds advanced	$175.00		
Profit on meeting	1,162.16		
Income From Meetings		1,337.16	
Total Cash Receipts			9,257.16
TOTAL AVAILABLE FUNDS			$ 11,377.14
CASH DISBURSEMENTS:			
Office Salaries		$ 2,600.00	
536 Subscriptions to Wire & Wire Products @ $5.00		2,680.00	
536 Directories @ $2.00		1,072.00	
Directors' Meeting		149.03	
Worcester Regional Meeting		222.83	
Los Angeles Regional Meeting		477.71	
Stationery and Printing		1,532.18	
Postage		684.60	
Total Cash Disbursements			9,418.35
CASH ON HAND - SEPTEMBER 30, 1954			$ 1,958.79

SCHEDULE #2

THE WIRE ASSOCIATION

STATEMENT OF OPERATING EXPENSES

ABSORBED BY QUINN-BROWN PUBLISHING CORP.

FOR THE PERIOD APRIL 1, 1954 TO SEPTEMBER 30, 1954

EXPENSES:			
Office Salaries	$3,900.00		
Less: Reimbursed by Wire Association	2,600.00		$1,300.00
Payroll Taxes and Insurance Thereon			195.00
Subscriptions to Wire & Wire Products:			
488 Domestic $3,904.00			
48 Foreign..... 504.00			
	4,408.00		
Less: Reimbursed by Wire Association	2,680.00		1,728.00
Directories:			
Subscription Price	1,608.00		
Less: Reimbursed by Wire Association	1,072.00		536.00
Advertising Space in Wire & Wire Products			1,952.00
Office Rent (400 Sq. Ft. @ $2.50)			1,000.00
TOTAL EXPENSES ABSORBED BY QUINN-BROWN PUBLISHING CORPORATION			$6,711.00

Auditors Statements On Operation Of The Wire Association from April 1 to Sept. 30, 1954.

The detailed data relating to the affairs of The Wire Association is shown in Schedule I and II on this page, so that all members may be acquainted fully with the technical and financial position of the Association.

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In 1930 we had 130 members. Today there are approximately 1100 members. During this 25 year period the relationship between the Association and Wire and Wire products has grown closer and Wire and Wire Products, through its continuing annual contributions, has materially helped the Association to function and to grow.

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The auditor's report covers only those contributions that could be estimated successfully and accurately. Such items as office supplies, telephone and telegraph costs, the use of furniture, fixtures, typewriters, etc., and all small miscellaneous expenses connected with the operation of the Association, have also been contributed by the magazine and, though considerable, it will be difficult to estimate them accurately. Such items have therefore been omitted from the auditor's report.

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It is the purpose of Wire and Wire Products to continue its support of the Association in this manner.

Government Wire Production Information

Paint, Varnish Simplified Practice Recommendations

A revision of Simplified Practice Recommendation R144-49, Paints, Varnishes, and Related Products (Colors and Containers), proposed by the Simplification Committee of the **National Paint, Varnish and Lacquer Association,** and approved by the recommendation's standing committee, has been submitted to producers, distributors, users, and others interested for acceptance and comment, the Commodity Standards Division, **Office of Technical Services, U. S. Department of Commerce,** reported.

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This recommendation gives a maximum number of colors and sizes of container for a variety of oil paints, enamels, varnishes, water-thinned paints and related products. It covers trade sales items only. It was first issued in 1924 as a Limitation of Variety Recommendation, and in 1932 was converted to a Simplified Practice Recommendation. It was revised in 1937, 1939, 1941, 1943, 1945, and 1949.

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The purpose of the revision is to bring the recommendation in line with current needs and industry practice. The proposed changes provide for an increase in the recommended maximum number of colors of six items of oil paints and related products, and four items of water-thinned paints and related products. The description of several of the items has been clarified as has the explanatory footnotes for certain items.

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Mimeographed copies of the proposed revision may be obtained from the Commodity Standards Division, Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C.

Government Publication on Failure of Metals Announcement of New Publication

"Mechanical Failures of Metals in Service," by **John A. Bennett** and **G. Willard Quick,** National Bureau of Standards Circular 550, 36 pages, 102 figures, 1 table, 30 cents.

★ ★ ★

For many years the **National Bureau of Standards has** been requested to examine metal parts that have failed in service for evidence bearing on the causes of these failures. The examinations have been undertaken at the request of other Government agencies such as the Civil Aeronautics Board, the Interstate Commerce Commission, and the Coast Guard.

★ ★ ★

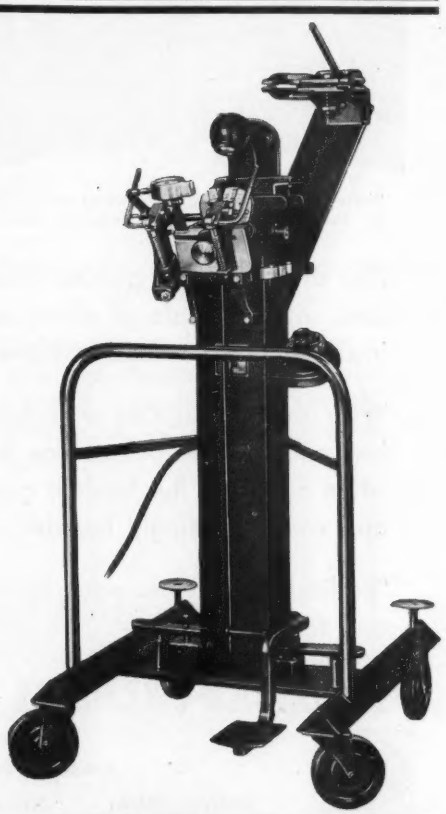
This circular describes 35 such cases representing the most frequently observed types of failures. The factors of design, fabrication, or use contributing to these fail-

MICROMETER PRECISION — MICRO-WELD — TRADE MARK REGISTERED

MODELS J-3-S and J-4-S AUTOMATIC MICRO-WELD BUTT WELDERS

These welders are used for welding high and low carbon STEEL, and STEEL ALLOY wire, ranging in size from .020" to .160" diameter. All operations on these units, which include the clamping of the wire being welded, contacting the welding switch, and upsetting the weld, are made by a single downward stroke of the foot pedal. Welders for high carbon steel wire are equipped with the exclusive MICRO-WELD Dial indicating annealing device to facilitate the annealing operation of high carbon wire.

Standard equipment with these units include annealing dies, filing vise, light extension cord, and mounting on a 4-wheel truck. Special units can be furnished for crane mounting.



MICRO PRODUCTS CO.

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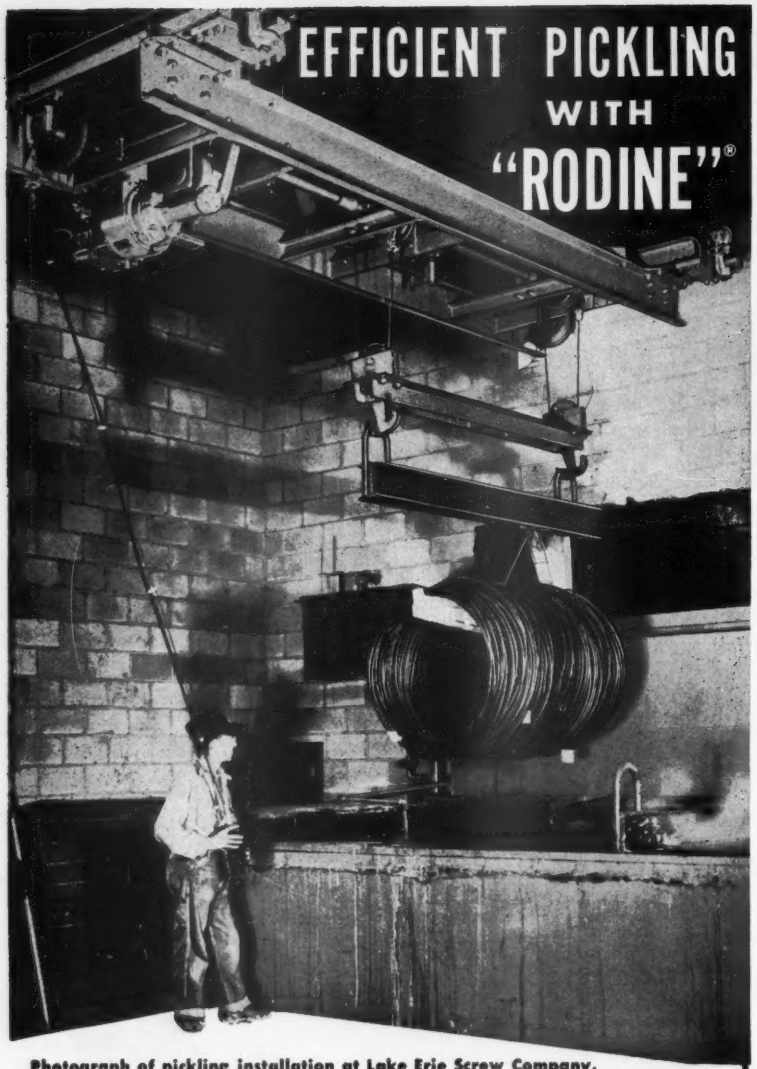


Photograph of pickling installation at Lake Erie Screw Company, by courtesy of The American Monorail Company, Cleveland, Ohio.

Rod and wire are pickled clean in "Rodine"-inhibited acid without waste of either acid or metal. Breakage in drawing, from acid brittleness, is minimized.

Wire and rod, pickled with "Rodine", as compared with less effective inhibition, are larger in diameter, and when drawn to the finished gauge the coils are longer and correspondingly heavier.

"Rodine" more than pays for itself in savings of acid and metal.

AMERICAN CHEMICAL PAINT COMPANY

CHEMICALS ACP PROCESSES

General Offices:

AMBLER, PENNSYLVANIA

Detroit, Mich. *Niles, Calif.* *Windsor, Ont.*

ures are presented. The characteristics by which the various types of fractures can be recognized are discussed, and recommended precautions that should be observed to reduce mechanical failures of metals in service are included.

★ ★ ★

The volume is well illustrated with photographs of the failures discussed along with photomicrographs showing sources of failure. It may be ordered from the Government Printing Office, Washington 25, D. C.

(NOTE: Foreign remittances must be in U. S. exchange and should include an additional one-third of the publication price to cover mailing costs.)

Visible Micrometer for The Tool Room Manager

Measuring "feel", which once was an all important asset of a good mechanic, has been superseded by the "Master Compar" Indicating Micrometer. The visible feature provided by this Micrometer-Comparator eliminates all uncertainties because the indicating mechanism controls the measuring pressure.

★ ★ ★

As a Micrometer, it is a master tool which may be used without the aid of gage blocks, having a range of 1″ and reading in .0001″. The visible measuring pressure, which makes this tool superior to any other, will result in the same accurate reading regardless of who does the measuring.

★ ★ ★

As a Comparator, the Indicating Micrometer can be used for checking work in small or large quantities. It indicates not only deviations in size, but gives also precise information regarding out-of-roundness and taper. Mounting it on a micrometer stand, will free both hands of the operator for fast and efficient inspection.

★ ★ ★

When used for inspection of mass produced parts, screw machine products, ground pieces etc., the "Master Compar" provides a complete set of GO and NO GO

gages zero to one inch range, in steps of .0001".

★ ★ ★

The heavy duty Tungsten Carbide anvils will make the Master Compar a "must" for every grinding department, screw machine operator, centerless grinding plant.

★ ★ ★

A circular will furnish all technical details, illustrations and price information. Write to **George Sherr Co.**, 200 Lafayette St., New York 12, N. Y.

Preview of Anaconda W&C's New Great Falls Aluminum Plant

The new aluminum rod-rolling mill of **Anaconda Wire & Cable Co.** in Great Falls, Montana is illustrated in this architect's perspective. The new plant will be completed early in 1955, and will be the only both full-fabricating and semi-fabricating unit within the Anaconda W&C Co. "family". Eighty-thousand square feet in area, the new plant will house a new million-dollar automatically operated aluminum rod-rolling mill for processing aluminum in addition to wire drawing and stranding equipment of the latest design valued at another million dollars.

New Aluminum Rod Mill at Great Falls

Harper Appoints Canadian Distributor

Appointment of the **Amco Furnace Contractors Ltd.**, 169 Eastern Avenue, Toronto, Ontario, as distributors is announced by the **Harper Electric Furnace Corporation**, 39 River St., Buffalo, N. Y., manufacturers of high temperature electric furnaces and kilns.

★ ★ ★

This company has long experience in the application of high temperature furnaces to the many

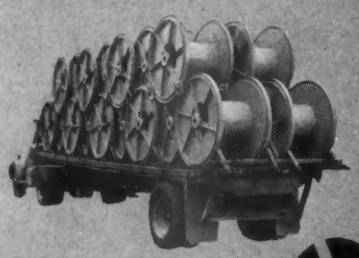
Manufacturers of Phillips head and other precision cold headed parts know a good thing when they *see the production records*!

In plants where Keystone "Special Processed" Wire is on the job, output per machine, per man, per hour has increased. Die life, for example, is often more than doubled — which in turn decreases machine down time and labor costs. A higher quality end product with its lower rejection rate helps place the per unit cost on a much more profitable level.

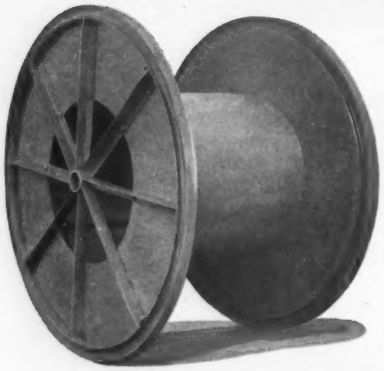
The superior grain flow characteristic of "Special Processed" Wire, together with its structural soundness, give this wire unsurpassed performance on any unusually difficult cold heading job. For further information, contact your Keystone representative or write direct.

There's no premium on INGENUITY at NYECO

Here are 32 Steel Shipping Reels being delivered on 1 especially rigged truck. One more example of the versatility and flexibility that go into every NYECO job . . . that make for happy customer relationships.



NYECO Steel Shipping Reels



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because they cost so little more, last *12 times* longer than wooden reels, require minimum maintenance. Rugged weatherproof, splinter-proof, warp-proof construction protects costly cable against damage due to dropping, bouncing, rough handling. It doesn't pay to risk an investment of thousands on inferior reels.

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SERVICE IS OUR BUSINESS: Qualified engineering staff will translate your problems into practical designs, from idea to finished product—or we'll work from your blueprints. 2 large modern plants with every automatic production facility, 100 in skilled personnel. Fast deliveries—motor, rail, water shipping at the premises.

For prompt, reliable, down-to-earth data and quotations

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TELEPHONE: WHitehall 4-5380 **CABLE:** NYECO, N. Y. **PLANTS:** YONKERS, N. Y.

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industrial requirements of heat processing including bright brazing and annealing of stainless steel, sintering metal powders, high speed steel heat treating, melting in crucibles, forging and general heat treating.

★ ★ ★

The growing demand for automatic processing of the new special alloys requiring maintenance of special atmospheres and precision control of temperatures is being met by specially designed automatic furnaces for continuous operation with minimum labor and materials handling costs.

★ ★ ★

Full information and engineering help on the complete line of Harper furnaces and kilns is available through Amco.

★ ★ ★

Data Sheet Describes New Four-Slide Machine

A new four-slide machine has been placed on the market by the **Wire Machinery Division** of the **Torrington Manufacturing Company,** Torrington, Conn. This describes and illustrates the Torrington E-402 S Four Slide Wire and Ribbon Forming machine.

★ ★ ★

The machine is provided with a self-aligning feed for the stock and the wire clamping member is independent and gives a positive pull for long or short lengths of wire without marring the stock.

★ ★ ★

Full details as to features and specifications are included. Production speeds range from 65 to 195 pieces per minute, depending on the job.

★ ★ ★

The data sheet will be sent to interested parties upon request to the manufacturer.

Cleveland Crane Announces Two Appointments

Roy Dehn has been appointed Director of Engineering of **The Cleveland Crane & Engineering Co.,** Wickliffe, Ohio, it was announced recently by **H. T. Florence,** Executive Vice President and General Manager. This is a new position created to integrate the

engineering activities of the company.

★ ★ ★

It is the first move in the 1955 expansion program, which will be announced in coming weeks, that is being embarked upon to meet the growing demands for the heavy cranes, overhead tramrail materials handling systems, metalworking presses and shears the company manufacturers.

★ ★ ★

Mr. Dehn has been with Cleveland Crane since 1937 and was Chief Engineer of the Heavy Machinery Division. Before coming to Cleveland Crane, he was with the Industrial Brownhoist Co., Bay City, Michigan, for seventeen years.

★ ★ ★

Alfred W. Schultz succeeds Mr. Dehn. He will be in charge of heavy overhead traveling crane, press and shear engineering. Mr. Schultz was formerly Chief Engineer and Sales Manager of The Cleveland Punch & Shear Works Co. for six years and was also with the Clearing Machine Corp. of Chicago.

Folder Describes Invisible Protection for Aluminum

A folder describing "Alodine" 1000 has been issued by American Chemical Paint Co., Ambler, Pa.

★ ★ ★

This chemical is not a lacquer, but a surface treatment that is economical, easy to apply and that does not change the appearance of the metal.

★ ★ ★

Complete technical details, with illustrations of production equipment are given in the folder, which may be secured by writing the company.

ABSTRACTS

IMPROVED NEEDLE THERMOCOUPLE FOR SUBCUTANEOUS AND INTRAMUSCULAR TEMPERATURE MEASUREMENTS IN ANIMALS AND MAN.
J. Krog (Arctic Health Res Centre, Anchorage, Alaska). Rev Sci Instr 1954 Vol 25 (8) pp 799-800 (Aug).
Method for construction of thermocouples inside No 25 hypodermic needle, strong enough for hard use in field, described. 1 illustr, 1 ref.
Y* **C 11.0**

Basic Materials

FOR A MILLION PRODUCTS

Alloy Wire, Rod and Strip . . .

Design Engineers are taking advantage of the outstanding mechanical and electrical properties and excellent formability of Alloy Wire, Rod and Strip. Results: Better products, smaller and lighter products, products that are more corrosion-resistant, more heat-resistant, more attractive —and more economical.

Alloy Metal Wire Division can supply you with high quality wire, rod and strip in Stainless Steels, Nickel Alloys and Electrical Resistance Alloys. Why not put these versatile materials to work for you?

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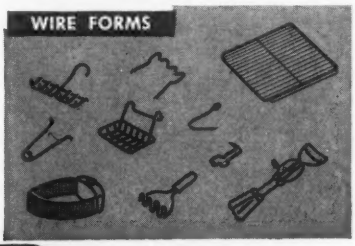
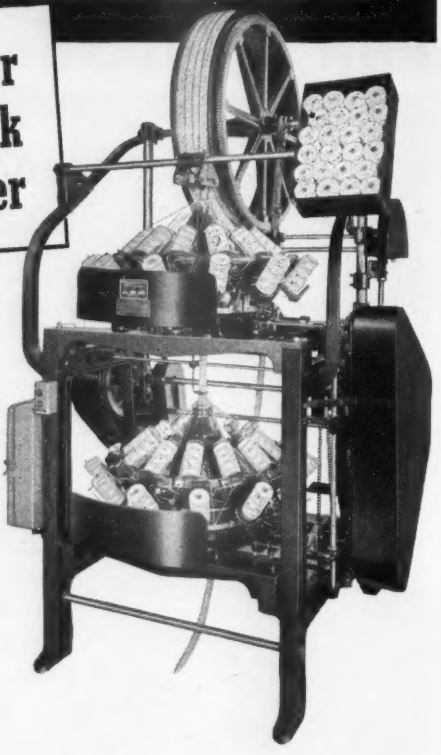


ALLOY METAL WIRE DIVISION

HKP H. K. PORTER COMPANY, INC.
of Pittsburgh
PROSPECT PARK, PENNSYLVANIA

THE NEW "WARDWELLIAN"®

24-24 Carrier Double Deck Cable Braider



This machine has all the features of the WARDWELLIAN Cable Braider, plus the added feature of applying two layers of braid simultaneously. Each head can be adjusted individually to give the desired number of picks or plaits for each layer of braid.

Machine is driven by a three horsepower adjustable speed motor that gives great flexibility of operation through the dial control. Power is transmitted from motor to braider through the medium of a Maxitorq Floating Disc Clutch mounted on the countershaft.

- Production 44" to 340" per minute depending upon the texture of the product.
- Standard set of eighteen change gears for varying takeup furnished with each machine.
- Standard set of ten change gears for varying speed of lower head furnished with each machine.
- Carrier speed 75 R.P.M. for cables ¾" diameter to the maximum of 1⅛" diameter or 500,000 circular mils; production 900 picks or plaits per minute.
- Carrier speed 100 R.P.M. for cables ¾" diameter and under, 1200 picks or plaits per minute.
- Speed of braider countershaft 345 R.P.M. for carrier speed of 75 R.P.M. or 460 R.P.M. of countershaft for carrier speed of 100 R.P.M.
- Ratio braider countershaft speed to carrier speed 4.6 to 1.
- Carrier speeds can be varied from a maximum of 100 R.P.M. to a minimum of 33 R.P.M.
- Capstan 36" diameter, 6" face.
- Beater openings in both upper and lower heads 1¾" diameter.
- Supply yarn packages Universal wound, 2 1/16" dia., 5" traverse, on tube 5¼" long, ⅜" hole, four point wind.
- Supply and windup stands not furnished.
- Machine can be adapted for producing one-and-one braid by changing thread deflectors.
- Counter for measuring in feet or yards furnished upon request.
- Weight approximately 2500 lbs.

REPRESENTATIVES FOR EUROPE, BRITISH COLONIES AND DEPENDENCIES
JAMES MACKIE & SONS, LTD.
BELFAST, IRELAND

Wardwell
BRAIDING MACHINE CO.
CENTRAL FALLS, RHODE ISLAND, U.S.A.

DER EINFLUSS DER SCHMIERSTOFFE AUF DIE ZIEHKRAFT BEIM ZIEHEN VON STABSTAHL. INFLUENCE OF LUBRICANTS ON THE DRAWING FORCE IN DRAWING BAR STEEL.

W. Lueg, K. H. Treptow, Stahl & Eisen 1954 Vol 74 (21) pp 1334-1342 (Oct 7) (In German).

Present state of technique, materials tested, influence of oil and grease lubricants, new lubricants (silicones and hydrocarbons). Influence of various lubricants and other factors on drawing force when drawing unalloyed and stainless steel. Comparison of physical and chemical characteristics of lubricants and their suitability for bar and wire drawing. 18 illustr, 12 ref, 4 tables.

G **C 11.0 : D 14.2**

BORAX AS A LUBRICANT IN WIRE DRAWING.

O. Peltzer, Stahl & Eisen 1953 Vol 73 pp 1424-1425 (Oct 22); abst Iron & Steel Journ 1954 Vol 177 (2) p 274 (June) (Original in German).

Y* **C 11.0**

MEASURING INSTRUMENTS FOR DETERMINING THE THICKNESS OF WIRE.

Sacks. Draht (Engl ed) 1954 pp 32-33 (Feb); abstr Iron & Steel Inst Journ 1954 Vol 178 (1) p 83 (Sep).

German 'slipping' micrometers for gauging moving wire described and illustr.

Y* **C 11.0 : D 15.0**

THE PRODUCTION OF COBALT-TUNGSTEN ALLOY FROM POWDERS

S. Stolarz. Inst Min Hutnictwa Prace 1953 Vol 5 (5) pp 298-302; abstr Iron & Steel Inst Journ 1954 Vol 177 (4) p 478 (Aug) (Original in Polish).

Production of Co-W alloy in form of wires, 0.5 and 0.75 mm dia, from powders by mixing, pressing, sintering and not drawing described. Results on tests of various properties, including hardness.

Y* **C 4.0 : C 11.0**

NEUZEITLICHE BEARBEITUNGSVERFAHREN UND IHRE ANWENDUNG BEIM BOHREN VON HARTMETALL- UND DIAMANTZIEHSTEINEN. MODERN MACHINING METHODS AND THEIR APPLICATION TO THE DRILLING OF SINTERED CARBIDE AND DIAMOND DRAWING DIES.

K. H. Treptow. Stahl & Eisen 1954 Vol 74 (21) pp 1370-1371 (Oct 7) (In German).

Survey of modern methods, eg electromechanical and ultra-sonic; ref also to electrolytic drilling of diamond dies as described in literature. 7 ref.

G **D 11.0**

CEMENTED CARBIDE DRAWING DIES FOR IRON AND STEEL WIRE.

H. Wedl. Draht (Engl ed) 1953 pp 38-45 (June); abstr Iron & Steel Inst Journ 1954 Vol 178 (1) p 82 (Sep).

Production, standardization, die design, causes of die wear, maintenance and reconditioning, inspecting methods and instruments described and discussed.

Y* **C 11.0 : D 11.0**

VERGLEICH VERSCHIEDENER SCHMIERMITTELTRAEGER BEIM ZIEHEN VON DRAEHTEN AUS NICHTROSTENDEM STAHL. Comparison of

various lubricants when drawing stainless steel wire.
H. Kuntze, A. Pomp. Stahl & Eisen 1954 Vol 74 (21) pp 1325-1334 (Oct 7) (In German).

Paper to Comm for Wire Working of VDEh, June 25, 1954. Composition and application of 3 different lubricants: salt/lime, Edelstahl Bonder 188 and SB Traegerschicht. Comparison tests made of enlargement of drawing die and of wear in reduction zone using sintered carbide drawing dies. Coeff of friction determined by drawing force measurement; also degree of elongation and deformation, and surface finish. Some data on drawing die production. During investigation, Alfameter used; Leitz-Forster instrument used for surface finish measurements, 17 illustr, 15 ref, 3 tables.
G **C 11.0**

COLD WORKING LUBRICANT.
Pennsylvania Salt Mfg Co. Autom Eng 1954 Vol 44 (9) p 388 (Sep).
'Pennsalt Foscoat process' consists in cleaning, pickling and applying new phosphate coating and specially developed lubricants to steel. In wet drawing of fine steel wire, new process gave 40% increase in production rate, simultaneously increasing die life 2½×. Other application cited. 1 illustr.
Y* **C 11.0**

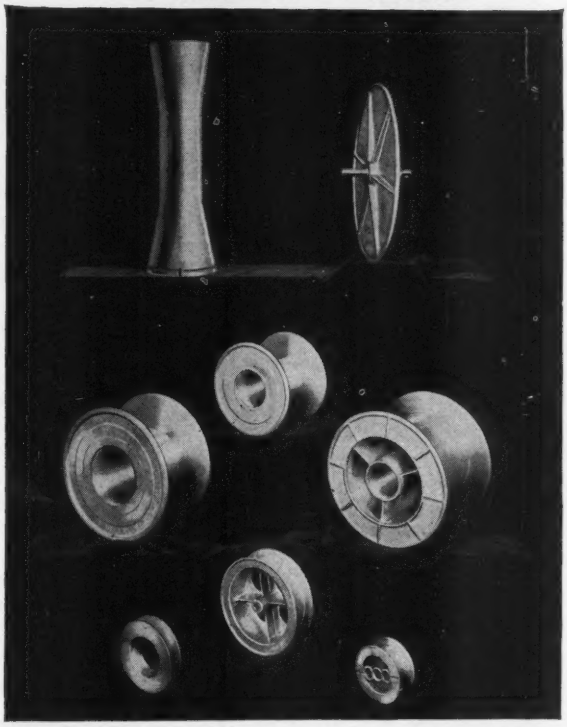
THREE STAGES IN THE DEFORMATION OF PLASTIC METALS.
W. Truszkowski. Arch Gorn Hutnic 1953 Vol 1 (2) pp 185-214; abstr Journ Appl Chem 1954 Vol 4 (9) col ii-347 (Sep).
Experiments with Al, Cu and monel metal wires drawn with back tension, Zn-Cu (99% Zn) alloy drawn without back tension, and rolled Zn, to study development of deformation in range of greater cold work and to determine strain limit marking end of second stage of deformation.
Y* **C 11.0**

DIRECT READING SMALL-HOLE GAUGE: ITS PRINCIPLES AND WORKING.
Anon. Pract Engg 1954 Vol 30 (757) p 296 (Sep 17).
Penetration depth of taper needle measured, indicating dia. Steel pencil with 10 deg taper point fits into collar carrying rod; calibrated in dia. If smallest hole likely to be measured is 0.015 in. dia, taper may be truncated to about 0.010 in. Spring-loaded sleeve automatically indicates dia at which taper point contacts hole edge. Formula for depth of entry. Device may be used for countersunk holes with simple calculation, if dia of countersink known. 6 illustr.
R **D 11.0: D 15.0**

These Abstracts have been prepared by and are furnished through the courtesy of the Industrial Diamond Information Bureau, 34 Holborn Viaduct, London, E. C. 1, England. Please direct inquiries regarding them to the Bureau.

Die Cast

ALUMINUM and MAGNESIUM SPOOLS and BOBBINS for SHIPPING and PROCESSING WIRE and TEXTILES



Industrial uses and applications of parts manufactured from die cast aluminum and magnesium are almost limitless. These new light weight alloys offer through the die casting process great savings in time, materials and much of the labor otherwise required for machining and finishing. In addition, the savings in weight often effect reductions of shipping costs.

Illustrated here are some of the spools and bobbins die cast by LITEMETAL in single units from aluminum and magnesium. Our extensive experience in the production of these spools and bobbins has proved their efficiency and economy for the processing and shipping of wire and textiles.

Let's Talk It Over . . .

LITEMETAL DICAST, INC. is an organization of specialists — men thoroughly experienced in the casting and machining of magnesium and aluminum alloys. Our equipment includes big machines for big jobs — little machines for little jobs . . . the right sizes and types of the most modern die casting equipment for producing parts from the size of a button to large cable spools. Complete facilities for secondary operations are also available.

Write today for literature and design information. Quick action on inquiries.

LITEMETAL DICAST, Inc.
A DIVISION OF HAYES INDUSTRIES
1939 WILDWOOD AVE. • JACKSON, MICHIGAN
PLANT AND EXECUTIVE OFFICES

Outstanding Personalities of the Wire Industry

Armco Research Man Honored

Dr. Alexander L. Feild, associate director of research for **Armco Steel Corporation,** and one of the nation's outstanding authorities on stainless steel, has been named Sauveur Medalist for 1954.

★ ★ ★

The Sauveur Medal was established in 1934 by the American Society for Metals, and is one of the highest honors in the field of metallurgy. It recognizes achievements which have made a marked contribution to the basic knowledge of metals.

★ ★ ★

Dr. Feild, who directs Armco's research in stainless steel, maintains his headquarters at the research laboratories at the company's Baltimore Works. He is a graduate of the University of North Carolina and has advanced degrees from North Carolina State College and Stevens Institute of Technology.

★ ★ ★

In 1923, Dr. Feild received the J. E. Johnson, Jr. Award of the American Institute of Mining and Metallurgical Engineers, and in 1940, the Modern Pioneer Award, both coveted prizes in the metallurgical field.

★ ★ ★

In his 35 years of research, Dr. Feild has been awarded 37 United States patents, and has written numerous technical papers and reports, most of them in his special field of stainless steel.

Anaconda W & C Advances di Lustro and Randall

Victor di Lustro has been appointed General Manager of all Mills of **Anaconda Wire & Cable Co.,** Hastings-on-Hudson, N. Y.; and **C. F. Randall** has been named Manager of Production Planning. Mr. di Lustro had been assistant General Manager of Mills; Mr. Randall, formerly, was Assistant-Secretary and Assistant-Treasurer.

★ ★ ★

The position of Manager of Production Planning, which Mr. Randall now occupies, is new to the company and was necessitated by the increasing importance, in recent years, of customer delivery and service. Mr. Randall will assist in production control and maintenance of adequate stocks, to insure prompt deliveries of copper and aluminum wire and cable, and accessory products to customers.

★ ★ ★

Mr. di Lustro joined National Conduit & Cable Co. in 1922 and was active in control of operations and production control. Within a few months of joining the company he was made Assistant Su-

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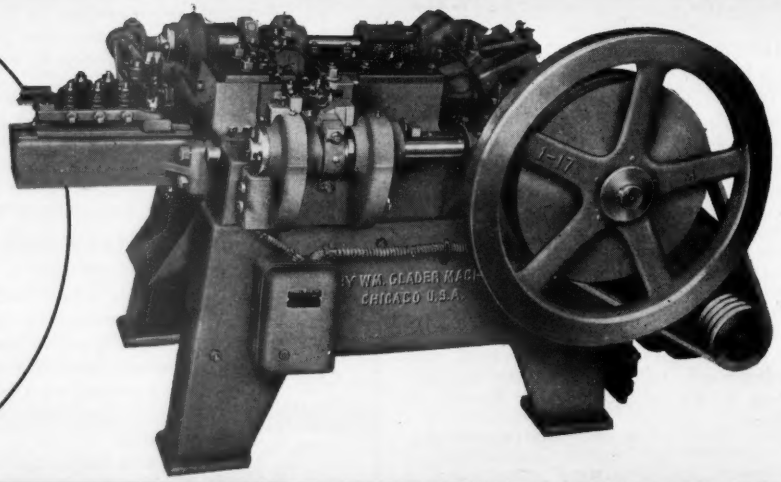
HIGH SPEED WIRE NAIL MACHINES

HIGH TONNAGE OUTPUT—LOW MAINTENANCE COST

You can take care of increased production schedules and better product demands with these machines of established reputation.

For 55 years GLADER MACHINES have been giving HIGH QUALITY, LOW COST nail production.



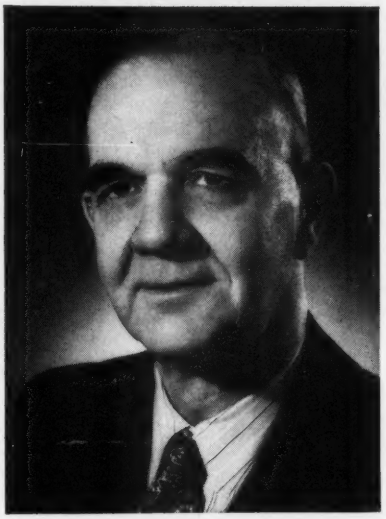
Wm. Glader Machine Works 210 N. Racine Avenue Chicago 7, Illinois

Export Dept.: 122 E. 42nd Street, New York 17, N. Y.

perintendent of the Hastings Mill. In 1927, he was made Superintendent of that mill, which in 1929 became a part of Anaconda Wire & Cable Co. In 1936, Mr. di Lustro was appointed Manager of the Hastings Mill of Anaconda Wire & Cable Co. He became Assistant General Manager of all Mills in 1943, which position he held until his present appointment.

Elected Vice President of Phillips Electrical Co.

The Board of Directors of Phillips Electrical Company (1953) Limited announce the appointment of **Mr. A. Lauder** as Vice-President (Production and Engineering). He was formerly Works Manager. Mr. Lauder joined the **Eugene F. Phillips Company** in 1913 and installed the equipment for manufacturing the first paper insulated power cable made by this company. He became a senior plant officer in 1922 and has been Works Manager since 1934. Mr. Lauder belongs to several trade and engineering societies and has many friends in Canada, U. S. A. and Great Britain, including The Wire Association.



A. Lauder

Ajax Electric Elects Officers

At a recent meeting of the Board of Directors of **Ajax Electric Company,** Philadelphia, **John E. Haig,** Vice President and Secretary, was elected President to succeed **William Adam, Jr.,** who died on November first.

★ ★ ★

Leon B. Rosseau, was re-elected Vice President, and **E. A. Ginkinger,** formerly Treasurer was elected Secretary-Treasurer.

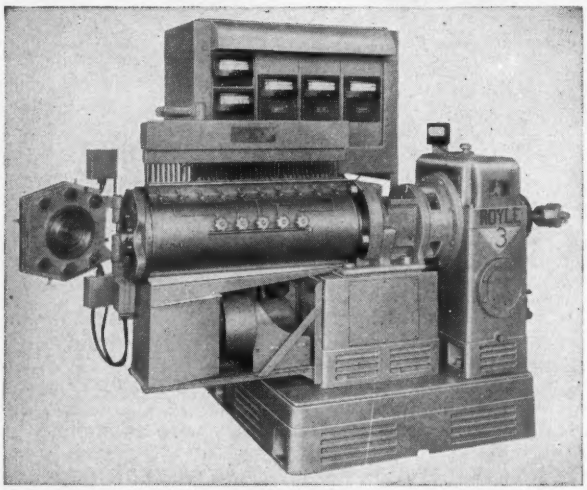
Two New Posts Filled by Alcoa

In a move designed to provide greater coordination of the increasing engineering activities resulting from the expansion of its aluminum production and manufacturing facilities, **Aluminum Company of America** has named **James P. Haight** to the newly created post of chief engineer.

★ ★ ★

At the same time, **John L. Patterson** was appointed general manager of Alcoa's fabricating divi-

FASTEST HEATING FASTEST COOLING



Here are some of the time-tested, money-saving reasons more and more plants are standardizing with Royle Spirod* Extruders for processes requiring maximum flexibility in controlled temperatures — constantly maintained and accurately zoned:

- **Extra heavy walled cast steel cylinders that will not warp. No joints to leak when pressures are high or crevices to collect burned compound that would cause contamination.**
- **Heavy duty large diameter heating elements, that can be used with 440 volts without step-down transformers, provide radiant heat to cylinders and heads.**
- **Any heating element may be removed and replaced without disturbing other elements or wiring.**
- **A cooling system with ten times the capacity of conventional designs can be modulated through its entire temperature range without drastic changes. Ample cooling for all compounds at maximum speeds.**

No. 3 Royle Spirod Extruder. Completely insulated and equipped for evaporative cooling.

*Patent Applied For

JOHN ROYLE & SONS

ROYLE PATERSON N. J.

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London, England — James Day (Machinery) Ltd. REgent 2430
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Los Angeles, Cal. — H. M. Royal, Inc. LOgan 3261

PATERSON 3, NEW JERSEY

CAMDEN WIRE CO., INC.

Wire Fabricators

EXTRA FLEXIBLE CONDUCTOR
STRANDED OR BRAIDED
MULTIPLE ENDS OF SIZES .008 to .002
BARE • TIN or LEAD COATED • SILVER PLATED

40 Masonic Avenue • Camden, New York

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FAIRHILL AND HUNTINGDON STREETS
PHILADELPHIA 33 PENNSYLVANIA U.S.A.

While our business was established in 1855 and incorporated in 1915, our first advertisement in the issue of Wire and Wire Products of September 1926, showing our heavy wire enameling machine of that date, is shown at the left. Our present model #997 with speed variator, electric pre-annealer, circulating system, etc., is illustrated to the right. This latter illustration shows the oven shortened to illustrate the top sheaves.

sion, succeeding Mr. Haight in this capacity.

★ ★ ★

Both men are veteran members of the Alcoa organization, having served in engineering and operating capacities for 35 years.

★ ★ ★

In his new responsibilities, Mr. Haight will have general supervision of Alcoa's construction, electrical, hydraulic and mechanical engineering activities.

★ ★ ★

Mr. Patterson will now direct manufacturing operations conducted at Alcoa's fabricating works locations throughout the United States.

Hubbard Spool Adds New England Representative

Hubbard Spool Company is pleased to announce that **Bryant W. Gillespie** has joined the organization as a sales representative in the New England area. This has been done to give better service to their many customers in that territory and to assist them in

Bryant W. Gillespie

solving their reel and spool problems promptly as they arise.

★ ★ ★

Ray Stout will continue to call in New England from time to time and will also service Hubbard's customers in Canada. **E. J. Hubbard** will continue to contact customers in the New York and New Jersey areas, and **John C. Kerr,** who has been with the company now for nearly two years, will cover the middle west territory and Pennsylvania. **L. A. Hubbard** will concentrate on special projects in addition to carrying on with some sales activities for the company.

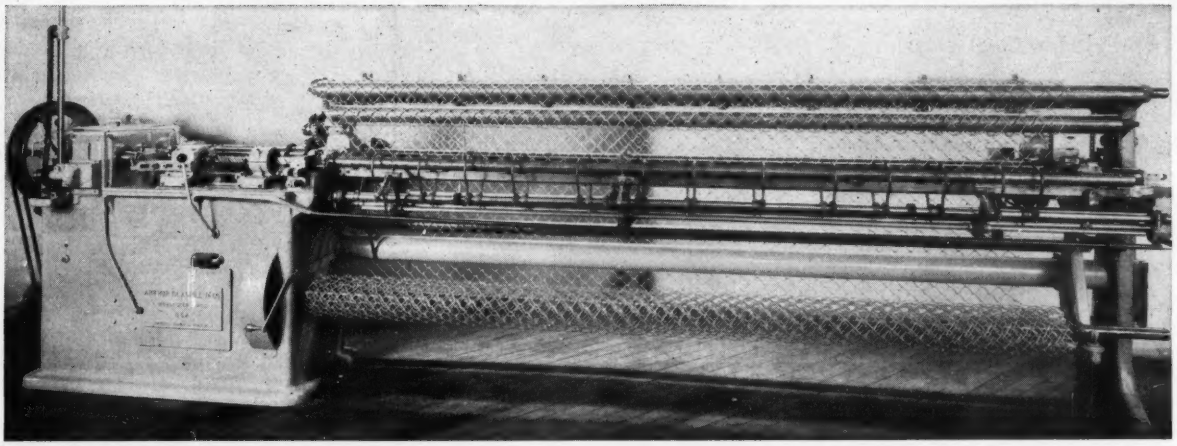
★ ★ ★

Hubbard Spool Company, whose new plant is in Garrett, Indiana, has always stressed service and makes these announcements in line with its continuous efforts to improve its ability to help customers on all reel and spool matters.

Froelich Elected President of Gulf Steel & Wire Sales Co.

C. G. Raible, President of **Gulf Steel & Wire Company,** Bayamon, Puerto Rico, U.S.A., announced the election of **Norman J. Froelich,** who has been associated with the steel industry for over 30 years, as President of Gulf Steel & Wire Sales Co. with offices in the Grant Building, Pittsburgh 19, Pennsylvania; also, the election of Mr.

INVINCIBLE CHAIN-LINK FENCE MACHINE



• Incomparably superior and saving in wire, output and space. • It soon pays for its first cost from these savings. • It is designed for the regular range of wire gauges, meshes and heights. • Either or both edges may be barbed or knuckled, as desired. • Its production, for example, on 2" mesh, #9 fence, 7' high, exceeds 2000 square feet per hour.

See it in operation here at our plant. It will convince. Please advise if and when you will call.

ARTHUR BLASHILL & COMPANY
91 Webster Street
WORCESTER, MASSACHUSETTS, U.S.A.

Froelich as Vice President and General Manager of Sales of Gulf Steel & Wire Company, Bayamon, Puerto Rico, U.S.A. now in production on merchant wire, manufacturers wire, welded chain, chain link fence fabric, nails, welding electrodes and rods, weldless chain, barbed wire, welded fabric, and high carbon spring wire.

★ ★ ★

Gulf Steel & Wire Sales Co. will act as the United States and Canadian exclusive sales agent for Gulf Steel & Wire Company, selling the various wire and wire products made by Gulf in its new plant at Bayamon, Puerto Rico.

Joins Coulter and McKenzie

The **Coulter & McKenzie Machine Company** of Bridgeport announces that **Joseph J. Kovaleski** of Ansonia, Connecticut, has joined the staff as DRAW-PAK Sales and Application Manager.

★ ★ ★

Mr. Kovaleski was formerly Assistant General Manager of **The Driscoll Wire Company,** of Shelton. While there he was instrumental in the origination and development of wire drawing and packaging machinery which is now being built by Coulter & McKenzie for the Wire industry. Coulter & McKenzie is internationally known for its wire and spring machinery.

★ ★ ★

Previously Mr. Kovaleski was

Joseph J. Kovaleski

associated with **The Union Wire Die Corporation,** the **Carboloy Company,** the **New England High Carbon Wire Company,** and is now acting consultant for the Allied Manufacturing Company of Worcester.

★ ★ ★

To Direct Research for Crucible

The appointment of **Dr. Maurice J. Day** as director of research and development for **Crucible Steel Company of America** was announced by **Joel Hunter,** president. Dr. Day was formerly associated with the Armour Research Foundation of the Illinois Institute of Technology where he was assistant director in charge of program development.

★ ★ ★

Dr. Day will maintain offices in the Oliver Building, Pittsburgh, Pa., Crucible headquarters. His appointment became effective December 1, 1954.

★ ★ ★

Dr. Day graduated from Michigan State College at East Lansing, Michigan, with a Bachelor of Science Degree in chemical engineering in 1934. He received a Master of Science Degree in electrochemistry in 1935 and a Doctorate of Philosophy in physical chemistry in 1937 from the same institution.

★ ★ ★

ATTENTION: Manufacturers of Non-Metallic Sheath Cable

WHY USE ASPHALT?

Carbro offers you a much
Cleaner, Better, Finish
without that tell-tale black asphalt mark.

Investigate our

New Thermoplastic Hot-Melt Finish

FLAME-PROOF—MOISTURE-RESISTANT
ELIMINATES THAT TELL-TALE "BLACK MARK"

SEND FOR DETAILS OF "NEW CABLE FINISH"

P.S.: Good for S. E. Cables, too.

CARBRO CHEMICAL CO.
PAWTUCKET, RHODE ISLAND

Manufacturers of Flame-proof Saturants, Wire Paints and Lacquer in all NEMA Colors for all types of Insulated Copper Wire

He began his professional career as a metallurgist with Carnegie-Illinois Steel Corporation, now part of United States Steel Corporation, at Gary, Indiana, in 1937. Later he served with the same company as a technical trade representative in Chicago, Illinois, from 1941 through 1945 and as manager of the alloy division (1945-1947) in Chicago.

★ ★ ★

Dr. Day also served with the United States Steel Corporation as a physical chemist at its basic research laboratory in Kearny, N. J., from 1938 to 1941. In 1947, he was named assistant metallurgical engineer for alloy steels at the corporation's Pittsburgh offices.

Joins Inco's Bayonne Research Laboratory As Head of Physics Section

Dr. Kenneth G. Carroll has joined the staff of the Bayonne Research Laboratory of **The International Nickel Company, Inc.,** as head of the newly-created Physics Section, according to an announcement by **Dr. W. A. Wesley,** Manager of the Laboratory. Dr. Carroll will be concerned with the application of such procedures as X-ray diffraction, radiography, X-ray fluorescence and electron microscopy to the research problems being investigated at the Bayonne Laboratory.

★ ★ ★

Prior to joining International Nickel, Dr. Carroll had been with the **United States Steel Corporation** at its Research Laboratory at Kearny, N. J., engaged in basic research in metallurgy, applying to metals the techniques of X-ray diffraction and electron microscopy. He is the holder of a United States patent on X-ray gauging of tin coatings on steel.

★ ★ ★

Dr. Carroll graduated from Carnegie Institute of Technology with a Master of Science degree in 1935, and Yale University in 1939 with a Doctor of Philosophy.

Joins Michigan Oven As Sales Manager

LeRoy M. Gill has been appointed sales manager of the **Michigan Oven Company,** Detroit, announces **A. C. Towne, Jr.,** President.

★ ★ ★

Guidance of Michigan Oven's entire national sales organization as well as foreign distribution for their principal product—industrial ovens—will be assumed by Mr. Gill.

★ ★ ★

Since joining Michigan Oven in 1949, he has worked in engineering, field erection supervision, and sales.

★ ★ ★

He was previously affiliated with Young Brothers and is a graduate of Lawrence Institute of Technology—a Detroit University.

Sales Shift at Oliver

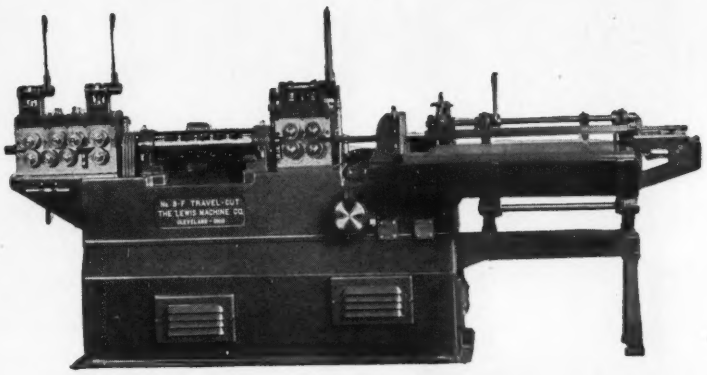
At the Industrial Fastener Division, **Oliver Iron & Steel Corp.,** Pittsburgh, **E. M. Welty** has been appointed executive sales representative. He is succeeded as General Manager of Sales by **E. L. Bartsch** and **Robert F. Neuhard** has been appointed Assistant General Manager of Sales.

Fast, Accurate, Economical

STRAIGHTENING and CUTTING

with LEWIS TRAVEL-CUT

(Trademark)



23 Models to handle from .012" to ¾" Round, Hex, Flat, Shapes.

Simple in design, rigid in construction, Lewis TRAVEL-CUT will deliver continuous dependable service under the most severe, high production conditions—day in, day out. Feeds wire from the coil, straightens accurately, gauges to uniform length, and cuts clean without stopping the wire. For steel, brass, aluminum and alloy wire. Cut your cutting costs with the Lewis TRAVEL-CUT. Full details on request.

Exclusive Representatives

EAST: Penn Machinery Co., 117 North Third Street, Philadelphia 6, Penn.

MIDDLE WEST: Steel & Wire Machinery Co., 15457 Euclid Ave., Cleveland 12, O.

CENTRAL: Moslo Machinery Co., 2443 Prospect Avenue, Cleveland 15, Ohio.

WEST COAST: Hoffman & Heartt, 3005 So. Grand Ave., Los Angeles 7, California.

CANADIAN: Empire Engineering Co., 738 Dundas St., East, Toronto, Ont., Canada.

CONTINENTAL EUROPE: Gaston E. Marbaix Ltd., Devonshire House Vicarage Crescent, London S. W. 11, England.

The LEWIS MACHINE Company

3441 E. 76th Street, Cleveland 27, Ohio

Also agents in Paris, Stockholm, Rotterdam, Brussels, Zurich, Milan, Bombay and Melbourne

Morris Simons

Morris Simons, founder and for twenty-eight years president of **The Union Wire Die Corporation,** and a predominant figure in the development and acceptance of the tungsten carbide die in the United States, died of a heart ailment November 19, 1954 after a brief illness. He was 67 years old.

★ ★ ★

Mr. Simons, came to this country at the age of 18. His first job in the United States was with General Electric in Schenectady and while working there, he attended Union College, where he obtained his Mechanical Engineering Degree. He was for many years a member of the American Society of Mechanical Engineers. In 1922 he founded Union Wire Die Corporation to manufacture diamond dies. Although perhaps they were later obscured by his work in the carbide field, Mr. Simons also contributed many advances in diamond dies as well, being the first to break away from the traditional low-cost flat stones then used by die makers, in favor of the round high-quality stones now accepted as industry standards. Since the supply of such stones was limited in the United States, he commenced his practice of buying in London and Antwerp which made him and Union Wire Die Corporation well-known in diamond circles.

★ ★ ★

In 1925 he started a factory in Paris, known as **La Filiere Union,** for the manufacture of diamond dies in the finer sizes in which the French have always specialized.

Morris Simons

The Paris plant began to manufacture carbide and carbide dies in the early thirties.

★ ★ ★

In 1928 Mr. Simons first saw the then untried metal called Tungsten Carbide, which had been produced by the Krupp Company. Seeing its potentialities for drawing dies, he immediately went to Germany and returned to the United States with an exclusive agency for Krupp metal. Union Wire Die produced their dies under the name Unwidia, and as **Kenneth Lewis** says in his book "Steel Wire in America", published by the Wire Association: "before long the two leading brands, Unwidia and Carboloy, were contending on equal terms".

★ ★ ★

The problem in those days, however, was not competition, but rather the struggle to induce mills

Refinishing Wire Drawing Dies?

Save Money with NORBIDE® Abrasive . . .

Second in hardness only to diamond which costs a hundred times more

Johnson Steel & Wire Co., Inc. has substantially reduced the cost of refinishing their wire drawing dies by substituting NORBIDE Abrasive for costly diamond dust. Excellent for ripping or for fast stock removal as well as for accurate semi-finishing operations.

High accuracy is important to Johnson for Johnson "music" spring wire is drawn in 200 different sizes, all the way from .003" to .200".

If you are still using diamond dust for your ripping and semi-finishing operations, you'll be amazed at the savings you can obtain by switching to NORBIDE Abrasive.

For cost-cutting abrasive details, write for Form 559.

NORTON COMPANY

45 New Bond Street • Worcester 6, Massachusetts

NORTON

BORON CARBIDE

NORBIDE® . . . the hardest man-made abrasive

during the depression, to make large expenditures for expensive tungsten carbide dies when chilled iron dies cost only a few cents each. "Steel Wire in America" has this to say:

"It was a lucky break for the industry that Morris Simons got in at the start, for during the dark days of the rocky start and the depression that followed, his faith in the product and in himself was nothing short of sublime. Where he got the cash in a day when nobody had any I shall never know, but he seemed ready, willing, even anxious to finance the wire business in the Dark Ages."

★ ★ ★

Mr. Simons had many patents on developments he pioneered, including those under which Union Wire Die Corporation made its own carbide in the United States. In 1937 he sold the American carbide business and patents to the Carboloy Company, remaining in the diamond die and diamond powder fields, and Union Wire Die Corporation did not return to the carbide field in the United States until he relinquished control of the company in 1950 to other members of his immediate family. He continued to own and operate his French plant in both the diamond and carbide fields at all times until his death.

★ ★ ★

It is worthy of note that many of the figures prominent today in the carbide industry, got their start by learning the business under Mr. Simons.

★ ★ ★

Appointed Manager of Industrial Furnace Division

The Gas Machinery Company, Cleveland, Ohio, manufacturers of gas generation equipment and industrial furnaces, announce the appointment of **Charles H. Schwerin** as manager of the Industrial Furnace Division.

★ ★ ★

In his new capacity, Mr. Schwerin will direct engineering, sales, manufacturing and installation of "Gasmaco" Industrial Furnaces which include rotary hearth, pusher type, car type, reheat furnaces, melting furnaces, wire patenting furnaces, clean forging furnaces, high temperature roller hearth and high temperature radiant tube fired furnaces.

★ ★ ★

Mr. Schwerin has had 19 years' experience in the industrial furnace field. His previous position was manager of sales and sales engineering for the George J. Hagan Company. He is one of the early pioneers of the application of automation to the heat treatment of steel, iron and aluminum. He initiated the use of automatic rotary hearth furnaces for heating slabs for plate mills and for heating blooms for rolling mills.

Alcoa Appointments

C. L. Kessler has been appointed chief metallurgist of the Massena Works, **Aluminum Co. of America, A. M. Miller,** becomes assistant chief metallurgist, Edgewater Works; and **F. O. Traenkner** has been appointed assistant chief metallurgist of the Massena Works.

It will pay you
to get samples of
PLYMKRAFT
IMPROVED CABLE FILLER
To keep up to date on cable filler developments, it takes only an inquiry for samples of PlymKraft. This improved type of twisted paper is available in the exact put up that works best on your equipment, with any type of treatment applied—wax, jute saturant, anthracene.
It is made to fine tolerance, always uniform, and backed by the Plymouth Cordage Company, known as the makers of top quality products since 1824.

Write to:

PLYMOUTH CORDAGE COMPANY

Plymouth, Massachusetts

A Review of Recent Wire Patents

No. 2,693,219, WIRE STRAIGHTENER, patented November 2, 1954 by Richard D. Heller, Tujunga, Calif., assignor to Heller & Paul, Inc., a corporation of California.

The straightener is adapted for use with wire contained in coils on reels or swifts and has an inherent set.

★ ★ ★

No. 2,693,291, WIRE REINFORCED CONTAINER AND METHOD OF MAKING SAME, patented November 2, 1954 by Sterling W. Alderfer, Akron, Ohio, assignor by mesne assignments, to Knapp-Monorach Company, St. Louis, Mo., a corporation of Delaware.

A cylindrical container body is provided with a reinforcing wire wrapped spirally around it and held in place by a split ring. There are nine claims.

★ ★ ★

No. 2,693,450, WIRE ROPE LUBRICANT COMPRISING A BLOWN RESIDUUM, A PETROLEUM WAX, AND A LIGHT CHLORINATED HYDROCARBON, patented November 2, 1954 by Roy F. Nelson, Port Arthur, Tex., assignor to The Texas Company, New York, N. Y., a corporation of Delaware.

The lubricant consists of a blown petroleum residuum from a paraffinic crude oil as the predominant constituent, about 5-15% by weight of petrolatum and about 5-25% by weight of a light chlorinated aliphatic hydrocarbon having a boiling point within the range of about 125-210° F., this lubricant having an ASTM unworked penetration in the range of about 120-150° F.

★ ★ ★

No. 2,694,001, POLISHING STAINLESS STEEL, patented November 9, 1954 by Selden C. Hayes and Joseph T. Lomakin, Baltimore, Md., assignors to Armco Steel Corporation, a corporation of Ohio.

Stainless steel containing chromium, nickel and carbon, may be polished by immersing the product to be polished in a bath essentially consisting of by volume about 2% to 8% nitric acid, 4% to 15% hydrochloric acid, 2% to 12% hydrofluoric acid, 3% to 18% sulphuric acid, and the remainder substantially water together with at least one organic compound of the alkaloid class amounting to about 0.05% to 6% by weight of bath for sufficient time and at such temperature as to achieve a polishing of the product.

★ ★ ★

No. 2,694,418, SPRING UNIT LACING MACHINE, patented November 16, 1954 by Victor J. Bergstrom, Chicago, Ill., assignor to Johnson Spring Cushion Company.

The machine is adapted for lacing together coil springs into a spring unit. There are seven claims.

★ ★ ★

No. 2,694,419, WIREWORKING MACHINE, patented November 16, 1954 by Joseph Clarence Larsen, Boulder, Colo., assignor to Gates and Sons, Inc., Denver, Colo., a corporation of Colorado.

This is a machine for twisting preformed concrete form ties of the type made from a single piece of wire having its ends bent into hooks, and folded about points that divide the wire into three substantially equal parts with bights at their points of juncture, the bights lying in the same plane, the hooks being positioned in the bights.

★ ★ ★

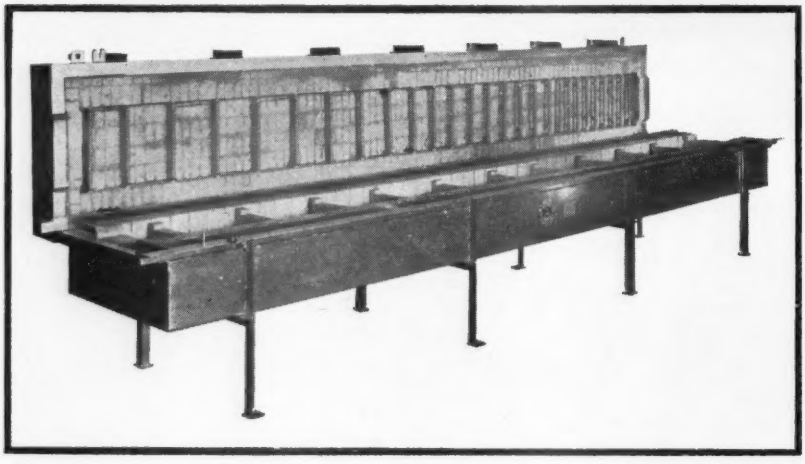
No. 2,694,650, INSULATED CONDUCTOR AND PROCESS OF MAKING SAME, patented November 16, 1954 by Clairmont J. Herman and Ralph D. Hodges, Fort Wayne, Ind., assignors to General Electric Company, a corporation of New York.

An insulated conductor is disclosed, comprising in combination a metallic wire conductor, an outer insulating layer of a polyvinyl resin and an inner layer of a solid polymeric fluorinated composition of either monochlorotrifluoroethylene or tetrafluoroethylene immediately adjacent the outer layer.

★ ★ ★

No. 2,694,809, APPLICATOR FOR ELECTRICAL CONNECTORS AND THE LIKE, patented November 23, 1954 by Quentin Berg, New Cumberland, Pa., assignor to Aircraft-Marine Products, Inc., Harrisburg, Pa.

Wire Annealing the Easy Way...



This may look like a Martian waffle iron. Actually it's a Rockwell continuous strand annealing furnace for brass, bronze and ferrous alloy wire that's doing a fine job in many wire mills.

The furnace has several operating advantages. Because it is hinged on one side, the upper half of the furnace can be readily raised for access to the entire interior. Multiple parallel tubes, through which the strands of wire pass, rest on brick piers and are readily available for removal or adjustment to any desired spacing. Protective atmosphere may be injected into the tubes ahead of the entry end of the furnace.

Dimensions depend on production requirements. The electric heating elements, mounted in the upper and lower halves of the furnace, provide uniform radiant heat to the tubes over the entire furnace area. We invite your inquiries.

W. S. ROCKWELL COMPANY

FURNACES • OVENS • BURNERS • VALVES • SPECIAL MACHINERY

2425 ELIOT STREET • FAIRFIELD, CONN.

Sales Representatives in Principal Cities

More specifically, the machine is for applying terminals at the ends of wire conductors. There are twenty-one claims.

★ ★ ★

No. 2,695,169, COIL SPRING, patented November 23, 1954 by Harold C. Keysor, Chicago, Ill., assignor to American Steel Foundries, Chicago, Ill., a corporation of New Jersey.

A straight spring bar is disclosed, for coiling into a helical spring having a pair of fulcrum points projecting transversely of the bar in opposed directions and being spaced from one another a whole number of turns plus one half turn when the bar is coiled with a number of turns about a helix axis.

★ ★ ★

No. 2,695,269, APPARATUS FOR ELECTROPLATING WIRE, patented November 23, 1954 by Alfred E. E. De Witz, Bedford, and Frank P. Roy, Burton, Ohio, assignors to United States Steel Corporation, a corporation of New Jersey.

An electrolyte tank is provided with a number of anodes in the form of flat shallow boxes of metal insoluble in the electrolyte having side, top and bottom walls, these anodes being disposed horizontally end-to-end and in spaced relation along the tank and supported with their top walls in a common plane below the top of the tank side walls, the anode top walls having a multiplicity of nozzle ports distributed thereover, an electrolyte-supply pipe connected to a wall of each anode other than the top wall and extending through a wall of the tank, the pipe and the anode being electrically insulated from the tank, a current-supply connection secured to each pipe externally of the tank, and cathode contacts spaced from each end of the anodes adapted to engage the stock from above.

★ ★ ★

The information in this section is furnished by the patent law offices of LANCASTER, ALLWINE & ROMMEL, 438 Bowen Bldg., Washington 5, D. C. Data listed is only a brief review of recently issued patents obtained by various U. S. Pat. Off. registered attorney for manufacturers and/or inventors. Complete copies may be obtained direct from Lancaster, Allwine & Rommel by sending 50¢ for each patent desired. Outside of the U. S. and Canada the cost is $1.00 for each copy.

Paper Manufacturer Moves to New Plant

National Waterproof Papers, Inc., manufacturers of waterproof papers for wrapping, insulating and other purposes, have announced their removal to new and larger quarters in Beverly, N. J. The company was formerly located in Camden, N. J.

Booklet for Copper and Bronze Wire and Cable Users

Spencer Wire Corporation, 555 Lehigh Ave., Union, N. J., manufacturers of copper and bronze bare and stranded wires for electric conductors and cables, have issued a two-color, 28-page booklet describing their products, facilities and processes.

★ ★ ★

The company has very complete facilities for processing heavy, intermediate and fine wires from rod, including wire drawing, annealing, stranding, bunching and packaging, each step of which is illustrated and described in text. Tables of sizes, tensiles and other data are included for each gauge and type of wire.

★ ★ ★

A copy of the booklet will be mailed to interested persons upon request to the company.

Join The WIRE ASSOCIATION and work with others to improve the industry. Send for booklet.

all sizes and constructions of high quality copper and bronze wire

SPENCER WIRE CORPORATION

555 LEHIGH AVENUE, UNION, N. J.

Plants at UNION, N. J. Telephone: MUrdock 6-7950

International Wire Products Corp.

Midland Park, N. J.

Fabricators of copper, stainless, monel, and steel strands and cables in the fine sizes.

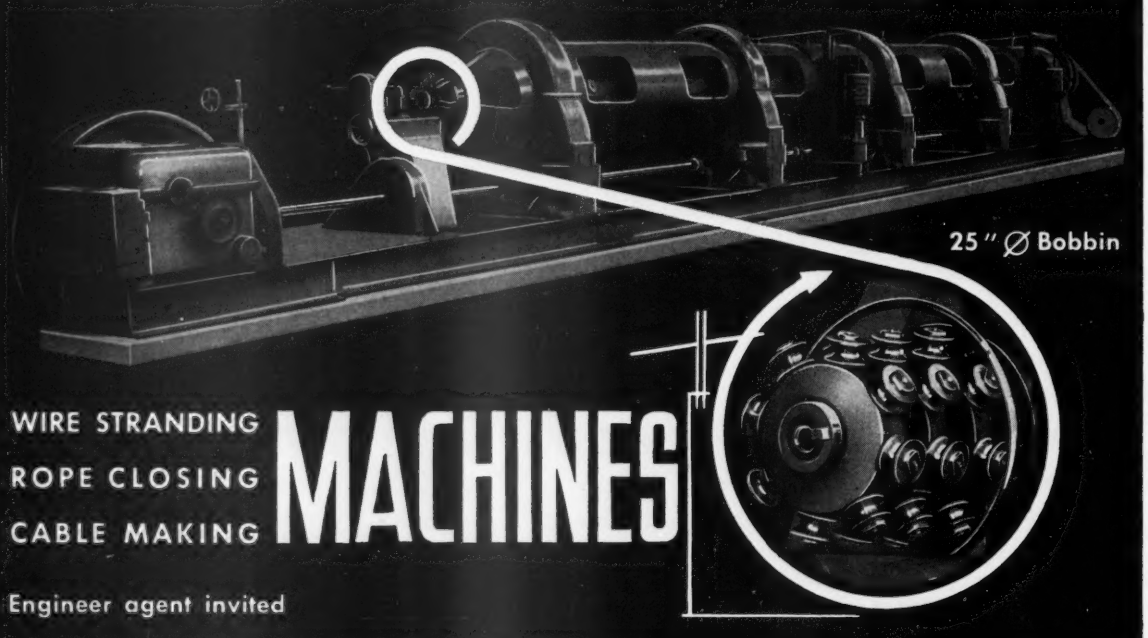
We invite special constructions for experimental cables and strands —for use in Engineering Department work.

We specialize in strands and wire for the costume jewelry trades— Gold colors and silver color strands and wires.

Our facilities include wire drawing, tinning and stranding of single end and multiple wires.

Strand annealing furnace for monel, stainless and silver plate wires —including phosphor bronze and brass from .040 to .002 fine sizes.

NIEHAUS High-Speed Tubular Stranding Machine



WIRE STRANDING
ROPE CLOSING
CABLE MAKING

MACHINES

Engineer agent invited

MASCHINENFABRIK K. A. NIEHAUS · GERMANY
DÜSSELDORF-RATH

Folder Describes Die Cast Spools and Bobbins

Lightmetal Diecast, Inc., 1935 Wildwood Ave., Jackson, Mich., a division of Hayes Industries, has issued a folder describing a line of die cast aluminum products, including spools and bobbins for shipping and processing wire.

★ ★ ★

These spools made to close tolerances are both strong and durable. For greater strength and wear resistance, the spools may be made with inserts of other materials to impart other desired properties.

★ ★ ★

The folder and other information may be procured by writing to Lightmetal Diecast, Inc.

★ ★ ★

New Folder on Buncher-Strander

Haskell-Dawes Machine Co., 2231 E. Ontario St., Philadelphia 34, Pa., has published a new bulletin on their compact 12 x 14—12 x 22 buncher-strander.

★ ★ ★

The machine features high production, a wide range of lays, ability to accommodate large reels and to function with great precision. It is engineered to meet customers' needs.

★ ★ ★

Production is 6000 feet per hour on work being closed with a one inch pitch of lay. Depending on size of reel, the flyer operates at 1000 to 1200 RPMS. Uniformity of the bunched wire is assured by its single twist operation, used in conjunction with positive capstan feed.

★ ★ ★

The bulletin will be sent by the company upon request.

Guide to the Selection of Engineering Irons—

Bulletin A-69, 28 page basic reference bulletin, compiled primarily for design engineers. Presents the many valuable characteristics of modern nickel cast irons and illustrates their broad acceptance throughout industry. 50 illustrations indicate wide industrial usage in all sizes and shapes. 27 useful tables, charts and photomicrographs show how through the use of nickel, alone or in combination with other alloying elements, the engineering properties of cast iron can be controlled to meet service requirements. The modern alloyed irons (NCI 30-80 Class irons with tensile levels of 30-80,000 psi.) with their greatly improved physical and mechanical properties can be produced by any foundry having reasonable control. **International Nickel, Co.** New York 5, N. Y.

Machine Shop Operations and Set Ups

This is a new book just published by the **American Technical Society,** 858 E. 58th St., Chicago 7, Ill., containing 397 pages of text and selling for $5.50.

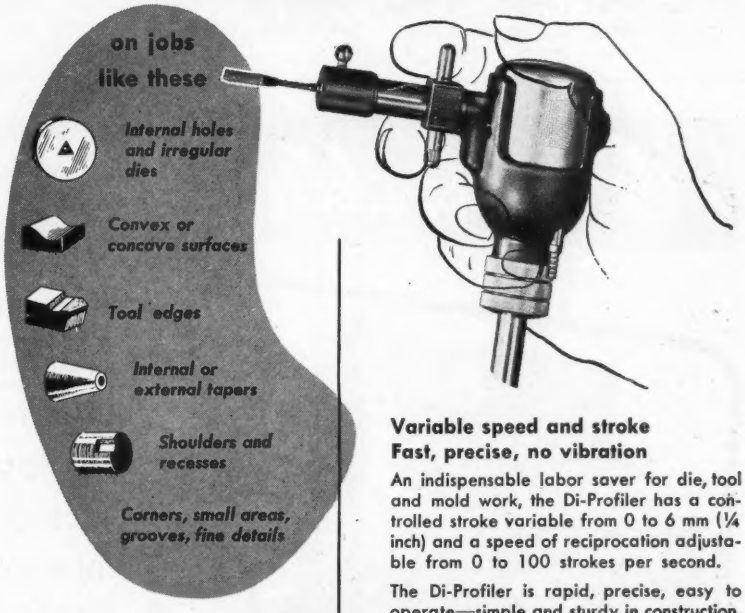
★ ★ ★

It covers machine shop techniques and will be found useful by managers and workers concerned with such operations. Great care has been taken by the authors to eliminate out-of-date practices and to define trade forms that con-

THE **Di-Profiler**

RECIPROCATING HAND MACHINE

for time-saving cutting—roughing—finishing


on jobs like these
Internal holes and irregular dies
Convex or concave surfaces
Tool edges
Internal or external tapers
Shoulders and recesses
Corners, small areas, grooves, fine details

Variable speed and stroke
Fast, precise, no vibration

An indispensable labor saver for die, tool and mold work, the Di-Profiler has a controlled stroke variable from 0 to 6 mm (¼ inch) and a speed of reciprocation adjustable from 0 to 100 strokes per second.

The Di-Profiler is rapid, precise, easy to operate—simple and sturdy in construction. Its weight of less than one pound and freedom from vibration eliminate fatigue and assure perfect control for the most intricate work.

Moderately priced, the Di-Profiler pays for itself many times through time-saving cost reductions.

Write for free demonstration or illustrated price list DW-155

Tools for every type of work
CUTTERS, FILES, DISCS, POINTS, BURRS, LAPS, SCRAPERS

ENGIS EQUIPMENT COMPANY
Sole Authorized Distributor for the United States
431 S. Dearborn Street, Chicago 5, Illinois

stitute a basic and modern shop vocabulary.

★ ★ ★

Through its ten chapters, in which machine shop tools and machines are fully illustrated and described, every important aspect of machine shop practice is covered. This includes measuring tools, bench tools, drill presses, lathes, shapers and planers, millers and grinding machines.

★ ★ ★

Copies may be ordered from the Society.

Announces New Line of Motors

A complete new line of industrial direct-current motors has been introduced to industry — the new Super 'T' Line Motors developed by the **Reliance Electric and Engineering Company,** 1088 Ivanhoe Rd., Cleveland 10, Ohio.

★ ★ ★

The controlled reaction of motors to the demand for a change with a "Dynamic Response," formerly found only in specially designed machines, is the standard of performance of these new motors.

★ ★ ★

They are described as producing the fastest and most accurate response ever offered in a standard design motor, and are reported to be twice as effective in many applications as any other motor now produced.

★ ★ ★

The design features of ruggedness, ability to take full load and overloads, ability to change speed rapidly, ability to maintain torque and tension, and reverse and stop quickly. The time required for the Super 'T' to accelerate to full speed has been cut to half the time that was formerly required. Lower mechanical inertia, lower electrical inertia and higher commutating ability have been combined to achieve this new high in motor performance.

Copies of a folder describing these motors will be mailed by the manufacturer upon request.

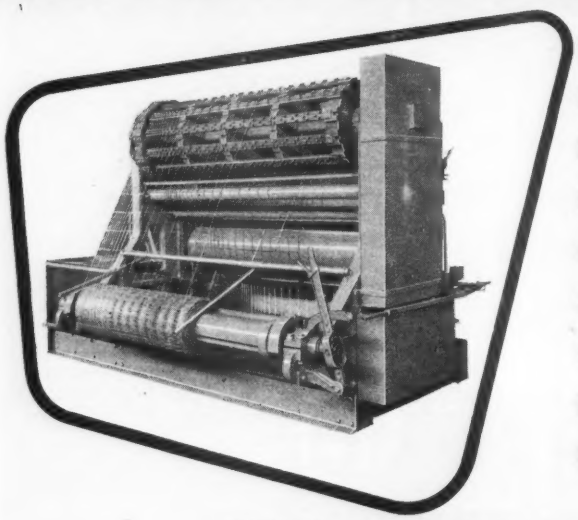
Introduces New Line of Light-Weight, Heavy Duty Shipping Reels

Word has been whispered in the trade for some time that Acrometal Products of Minneapolis was preparing a surprise entry in the field of special shipping reels, but nothing definite came out until the recent Wire convention, when the wraps came off of a new line of Acro-metal big reels made especially for heavy production.

★ ★ ★

These reels are made of a special aluminum alloy known for its strength and toughness, yet the saving in weight is considerable by comparison with steel reels. At the convention, in the presence of many interested spectators, one of the Acrometal representatives repeatedly swung a 5 lb. sledge on these reels without breaking the metal—a startling demonstration.

Interlocking **FENCE LOOMS**



- Fastest — Most Efficient
- Preferred by Leading Mills
- Low Maintenance Cost
- Wrapped Stay Fence
- Straight Stay Wires
- Integrated — Space Saving
- Replaceable Main Bearings
- Single or Double Strands
- Years of Low Cost Production

Write for Detailed Information — Without Obligation

Interlocking Fence Co., Box 8, Morton, Ill.

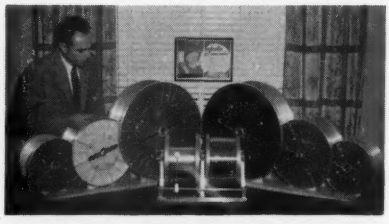
Specialists In Fence Looms

"Where else," asks **Fred Bieber,** manager of **Acrometal Products, Inc.,** "can you find a cast spool that will take this kind of abuse?" There are also advantages inherent to the design that add to the strength and rigidity of these reels.

★ ★ ★

The workmanship of these new reels is of the same high standards as their smaller spools. They are machined to close tolerances—plus or minus .0010 of an inch. In fact, at the Convention, where these reels were on exhibit, the public was invited to run their own accuracy check with micrometers. Extreme accuracy thus improves winding and reduces wire spoilage.

★ ★ ★



The smaller spool in the foreground is equipped with a contact micrometer to run such a test.

Fred Bieber also points out that "these reels, being made of aluminum alloy, the timeless metal, will therefore not be subject to the deteriorating elements that attack other materials. There is no wood to warp or rot. These reels can be stored outside without damage. They will always retain their accuracy, while their strength and toughness assures long life."

New Brake Manual on Metal Forming

A new 16 page Brake Manual illustrating how a single Di-Acro Brake can be converted into a Bar Folder, Tab Former, Radius Former, Open End Brake, Standard Brake or Box and Pan Brake simply by changing the Top Forming Bar has been announced by **O'Neil-Irwin Manufacturing Company,** 635 Eighth Avenue, Lake City, Minnesota, makers of Di-Acro Precision Metalworking Machines.

★ ★ ★

Entitled "Handy Guide to Aid in Selecting and Operating Di-Acro Brakes", this manual contains more than 35 photos and diagrams showing the variety of ways the ten models of Di-Acro Standard, Box Finger and Radius Brakes can be set up for production or experimental forming jobs.

★ ★ ★

Specifications and capacities on all Di-Acro Brakes are listed in table form for easy reference. Capacity of all Di-Acro Brakes is 16 gauge mild sheet steel, according to the company.

★ ★ ★

A complete parts list for all Di-Acro leaf-style Brakes is also shown.

Folder Describes High Speed Brass Rod

A folder giving complete data on Scovill Free Cutting High Speed Brass Rod, has been issued by **Scovill Manufacturing Company** 99 Mill St., Waterbury 20, Conn.

★ ★ ★

Tempers, compositions, finishes, sizes, shapes and advantages of these brasses are included, with notes on special tempers for special applications.

★ ★ ★

Please direct inquiries for the folder to the company.

Thermoplastic Cable Sheathing Kraft

the patented paper used in

NONMETALLIC SHEATHED CABLE

Is highly water repellent.
Available in all weights
both creped and flat.

Merrimac Paper Co., Inc.

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Varnishing, Saturating, Tubewinding
and Insulating Papers

New Plant for Pigment Concern in Texas

Plans have been laid for the immediate construction of a new plant to supply polyethylene producers with dispersed pigments and carbon black at Orange, Texas, it has been announced by **Howard A. Acheson,** President of **Acheson Industries, Inc.,** 420 Lexington Ave., New York 17, N. Y.

★ ★ ★

The plant is to be known as **Acheson Dispersed Pigments (Texas) Inc.,** and is a corporate subsidiary of Acheson Industries. It is an extension of an operation already well founded under the name Acheson Dispersed Pigments Co., 2250 Ontario St., Philadelphia 34, Pa., and will be the fourth unit of Acheson Industries, which includes also Acheson Colloids, Ltd., Slough, England.

★ ★ ★

Acheson Dispersed Pigments Co., of Philadelphia will market for and generally supervise the production of the Orange plant.

Texas was chosen for the expansion of the dispersed pigments business since this section of Eastern Texas is fast becoming the polyethylene center of the world. Such producers as **E. I. DuPont deNemours & Co., Inc., Bakelite Division of Union Carbide & Carbon Corp., Spencer Chemical Co., Monsanto Chemical Co., Dow Chemical Co., Koppers Co.,** and **Texas Eastman,** all are scheduled for new or increased production of this new plastic within the next two years.

New Diamond Compound Offers Greater Economy

An improvement in the formulation of a Diamond Lapping Compound developed here is reported 1.7 times, by actual test, as economical as diamond powder. This is made possible by the development of a water dispersible vehicle which has increased the "adhesion" of the compound to the work piece; this is especially necessary when fast rotation laps are employed.

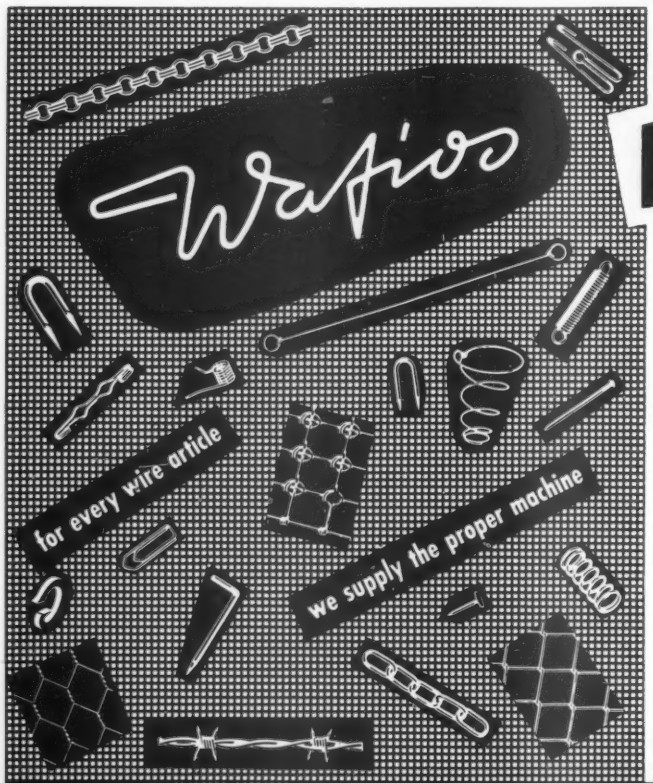
Immediate advantage of this increased economy is available to plants employing lapping and polishing operations on carbide, sapphire, steel and other hard materials, as well as to concerns performing precision grinding and plastic mold polishing.

★ ★ ★

The new compound is said to have these distinct advantages: it is fully dispersible in water; it will not dry out, roll up or become unworkable even after long periods of use; it gives good adhesion to the work piece; it provides excellent dispersion for the abrasive; each grade is colored distinctively, and for ease of identification the colors follow the visual spectrum from violet to red.

★ ★ ★

For an interesting folder write **Diamond Dust Company, Inc.,** 15 West 44th Street, New York 36, N. Y.



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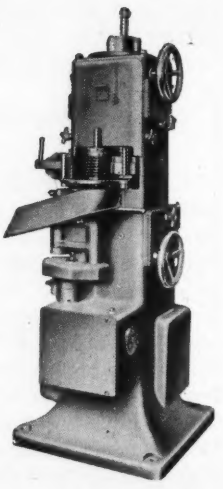
FOR THE WIRE TRADE

HIGH SPEED
WIRE NAIL PRESS

9 different sizes.
Wire diam. range: SWG 22-3
Length of nails: ¼-12"

Sole Agents: Kurt Orban Co., Inc.
34 Exchange Place, Jersey City 2, N. J.



WAFIOS MASCHINENFABRIK REUTLINGEN 3 / GERMANY

Wire Drawing Lubricants for Mechanical Descaling

A reprint of a paper on the above subject is available from the **R. H. Miller Company,** Homer, N. Y. The paper was published in Wire and Wire Products in May, 1954.

★ ★ ★

The paper was presented as part of a symposium on lubricants for drawing mechanically descaled rod by **Walter A. Smigel,** General Manager of R. H. Miller Co.

★ ★ ★

Mr. Smigel has had twenty years of experience in the lubrication field, having been with C. H. Clark Oil Co. and Chase Brass and Copper Co., before joining Miller in 1940.

★ ★ ★

The subject is timely, in view of the growing use of mechanical descalers, and in it the author gives information on both dry and wet drawing, with observations on suitable lubricants gathered from his experience on problems involved.

★ ★ ★

Copies of the paper may be secured by writing to the company.

Survey Reveals Big Savings Possible by Using Non-Returnable Reels

Bridge Manufacturing Company, Hazardville, Conn., conducted a two year survey on the cost of using non-returnable reels as against returnable types, with startling results.

★ ★ ★

While wire rope manufacturers have been using non-returnable reels for some time, most electric wire and cable mills have been burdened with the old method of using returnable reels. It has been, revealed that savings of 50% or more are possible by using non-returnable reels for electric cable.

★ ★ ★

The results of the Bridge survey are available. It shows that smaller reels of cheaper construction will do away with return-freight charges, storage, inspection, damage costs, bookkeeping on reel inventories and many other expenses that add to the cost of shipping cable.

★ ★ ★

Bridge's wood reels are all good, whether returnable or non-returnable, and the company offers the electric cable industry the results of its findings. You are invited to investigate the Survey-findings.

Cut-Off Wheel for Rope

Norton Company, Worcester 6, Mass., has a cut-off wheel especially designed for wire rope of all sizes.

The wheel is a 16 x 5/32 x 1 inch, A 24-VI OBN resinoid Norflex cutter, combining safety and strength and can be operated at speeds of approximately 3400 revolutions per minute.

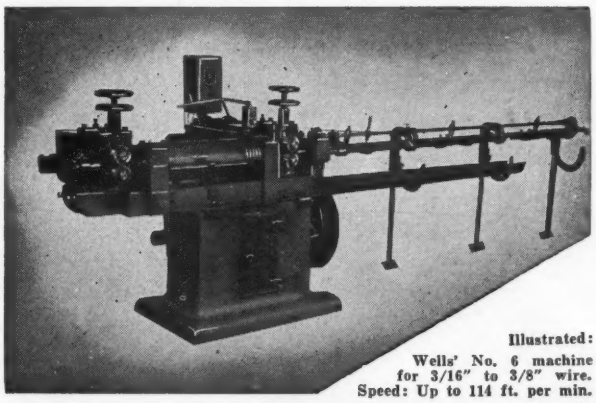
★ ★ ★

The cutting is done easily, quickly and without deforming or unraveling the wire strands.

★ ★ ★

Information will be supplied by Norton upon request.

If You Want **DEPENDABILITY ECONOMY and SPEED, use a WELLS STRAIGHTENER AND CUTTER**



Illustrated: Wells' No. 6 machine for 3/16" to 3/8" wire. Speed: Up to 114 ft. per min.

PREFERRED WHERE CONTINUOUS PRODUCTION AND ACCURACY ARE FACTORS OF IMPORTANCE.

WELLS NO. 6 cuts wire in any lengths from 7½" to 25'.

Straightener flyer runs on ball bearings. Gear drive and motor are enclosed in the base and are accessible through a door.

WELLS Straightening and Cutting Machines have long been noted for their dependability, even on the most difficult and trying jobs. Fully automatic and time-tried.

Built in a full range of sizes, these machines are the result of 59 years of experience and continuous improvement.

Send for Catalog covering the full line.

Frank L. Wells Company

KENOSHA • 5821 Fifth Avenue • WISCONSIN

Builders of Fine Wire Working Machinery

Add New Unit to Fence Mill at Wickwire-Spencer

A new structure has been added to the fence mill of the Wickwire Spencer Steel Division of C.F. & I. at Buffalo, to provide a new area of operations for cleaning, preparing and hot-dipping chain link, the company has announced.

★ ★ ★

The new unit, approximately 105 by 40 feet, is equipped with modern technical devices and controls for temperatures at the flux and zinc baths.

★ ★ ★

The firm also announced the Buffalo fabric department set a new shipping record last August of 4,450 tons. The previous high was in July, when 4,326 tons were shipped.

Norton to Announce New Selling Plan

Plans will soon be announced by **Norton Company** of Worcester, Mass., for the leasing, rebuilding, trading-in, and time payment arrangements on some of its standard grinding and lapping machinery.

★ ★ ★

The company is prepared to lease certain standard machines on a leasing arrangement similar to that used by the Kearney & Trecker Corporation, including their plans A, B, and C, and will furnish a list of the machines covered by the new arrangement.

★ ★ ★

Other machines will be considered for special leasing arrangements as the occasion arises.

★ ★ ★

Norton Company is expanding its rebuilding operations and has determined a list of certain machines which it will rebuild for a firm price of 45% of the price of a corresponding new machine with the same equipment.

★ ★ ★

Other Norton machines will of course be rebuilt but pricing will have to be determined specially in each case. All rebuilt machines will carry a new machine guarantee.

★ ★ ★

In many replacement programs, a considerable advantage may be gained if the original equipment can be taken in trade. Norton Company is willing to consider such trades on a limited group of readily salable machines.

★ ★ ★

The Company is also considering plans for time payments in purchasing new machines. These arrangements will be handled through distributors and will be limited to those machines which are available for lease.

TO SELL—ADVERTISE IN
WIRE AND WIRE PRODUCTS
It pays—send for rates
453 Main St. Stamford, Conn.

Important DIFFERENCES
BETWEEN JUST ANY REEL AND
All Welded MPS

TAKE-OFF REELS

Three important differences that mean longer reel life in both processing and handling of all types of insulated wires in your plant.

1 New MPS **deep wide, straight type embossed radial rib** adds considerable strength to reel heads over the old style narrow tapered rib.

2 **Increased height of the curled edge** adds even more strength and rigidity, especially to the rims.

3 Furnished with **rib fillers** that are projections on the end of the barrels that fit into the embossed radial ribs thereby **eliminating any marking of the plastic or rubber insulated wires** at the junction of head-barrel.

4 Finally, the **all welded "J" type construction** of the entire reel completes the picture.

The finest Take-off reel you can buy.
We invite your inquiries — let us tell you more about MPS Take-off Reels. Write us today.

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50 times FASTER than HAND

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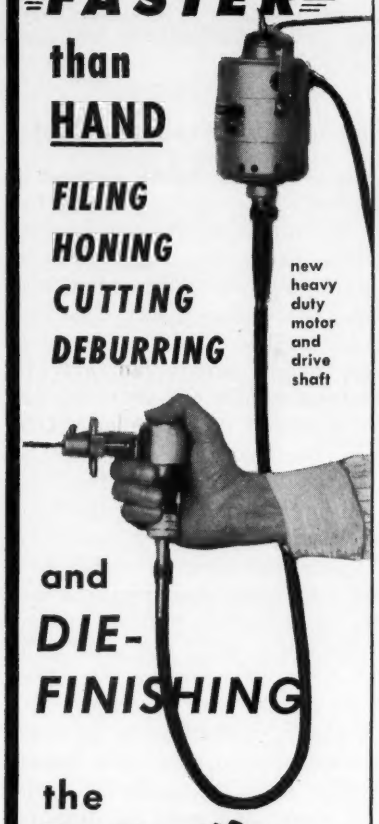

and DIE-FINISHING

the Di-Profiler TRADEMARK

This is the ORIGINAL "improved" motor driven die filing and cutting tool that speeds up the tool makers' fine work. It takes the hard work out of die-finishing providing from 0 to 15,000 reciprocating strokes per minute with foot control.

Tests have proven that this precision tool speeds up die work by as much as 50 to 100 times.

Even sharpens carbide dies

DISTRIBUTED By the makers of Nibblex and Nordex Metal Cutting Machines

Write for complete illustrated literature and prices. Our representative will demonstrate.

Nordel International
CORPORATION
449-W CENTRAL AVENUE
ORANGE, NEW JERSEY

The Silver Anniversary Convention of The Wire Association

(*Continued from page 75*)

This tour concluded the 1954 Convention activities.

Conclusion

Credit for the fine program of papers and events goes to **A. Earle Glen,** Manager of Die and Wear Part Sales, **Carboloy Department of General Electric Company,** General Program Chairman, and his committeemen. These were:

FERROUS DIVISION

Chairman:
Raymond S. Worth, Mfg. Manager
Wire Mills Division
John A. Roebling's Sons Corp.
Roebling, N. J.

Committee Members:
H. J. Godfrey
Asst. Chief Development Engineer
John A. Roebling's Sons Corp.
Trenton, N. J.

R. H. Hertzog
Metallurgical Engineer
John A. Roebling's Sons Corp.
Wire Mills Division
Roebiing, N. J.

NON-FERROUS DIVISION

Chairman:
James E. Flood, Chief Chemist
Plastic Wire & Cable Corporation
Jewett City, Conn.

Committee Members:
Andrew Pudlak, Field Engineer
Copperweld Steel Corporation
Glassport, Penna.

Grayson B. Wood, Jr., Mill Prod. Eng.
Scovill Manufacturing Company
Waterbury, Conn.

Glenn J. Moher, Manager of Methods
Wire and Cable Section
Canadian General Electric Co., Ltd.
Peterborough, Canada

GENERAL ACTIVITIES

Executive Secretary:
Richard E. Brown
The Wire Association
Stamford, Conn.

Registration:
R. S. Spengel, Asst. Exec. Secy.
The Wire Association
Stamford, Conn.

Entertainment:
Eber J. Hubbard, President
Hubbard Spool Company
Garrett, Ind.

★ ★ ★

Attendance was not as high as in 1953, but advance reservations, 579, exceeded any previous levels. The difference lay in the fact that Detroit is not a wire city, like Chicago, Cleveland or Pittsburgh, and there were not as many from the area to draw upon. In such cities there are a hundred or more persons who can attend, but who return to their homes in the evening.

ANACONDA® copper and copper alloy WIRE in all Commercial Tempers and Sizes including Round, Flat, Hexagonal and Special Shapes.

WIRE FOR SPECIAL PURPOSES
Copper, Brass, Bronze, Everdur and Nickel Silver in special grades for the manufacture of rivets, nails, pins, piano hardware, etc. Fine Wire on spools.

RESISTANCE WIRE
Nickel Silver.

WEAVING WIRE
Bronze (Antique Golden), Brass, Nickel Silver, Everdur*, Phosphor Bronze, Copper and FourdrinierWire.

SPRING WIRE
Brass, Phosphor Bronze, Everdur.
*Trade Mark Reg. U.S. Pat. Off.

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General Offices:
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Philadelphia, Providence

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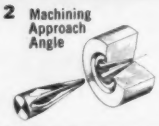
RAYTHEON

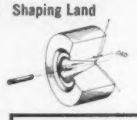
ultrasonic machining SAVES up to $240 on this Carbide Drawing Die

1 Standard Cored Blank

2 Machining Approach Angle

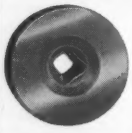


3 Shaping Land



Only two quick operations from cored blank to finished die . . . using simple, low cost tools. Cost per die cut from $300 to under $60 . . . enough to pay for the equipment in 10 months on just these dies alone — with savings on other dies as a big bonus.

These are the benefits a manufacturer of ESS-shaped trolley wire obtained with the new Raytheon Ultrasonic Machine Tool. Learn how this new abrasive machining process will save time and money for you in forming, grinding, slicing, trepanning or cutting shaped holes in hard or brittle materials. Write for complete information.



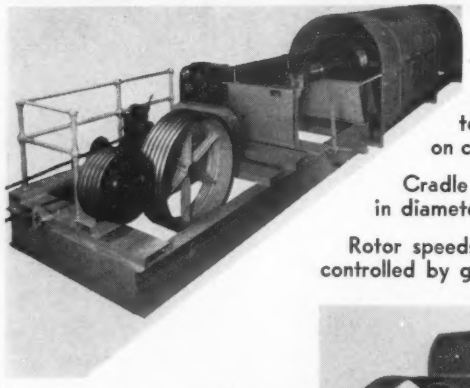
4 Finished Carbide Die. Time — only 1½ hours! Cost — $240 less than former method!

Address Dept. 6120 WP

RAYTHEON MANUFACTURING CO.
Equipment Marketing Division
WALTHAM 54, MASSACHUSETTS

RAYTHEON
Excellence in Electronics

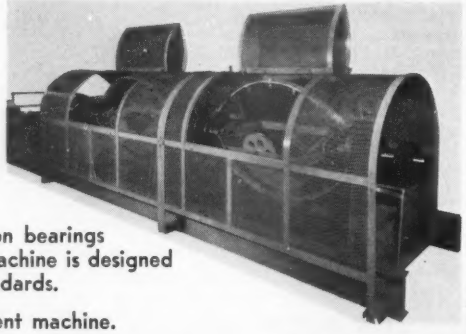
THREE-WIRE HEAVY DUTY TWISTING MACHINE



Built to handle wire from #14 to 500,000 circular mils in size on cradle reels.

Cradle reels either 30", 36" or 48" in diameter.

Rotor speeds from 800 r.p.m. to 30 r.p.m. controlled by gear box and dual drive.



Capstans either single with fleeter sheave as shown or double with diameters of 30", 36" or 42". Rates of lay from 1½" to 36".

Welded steel frame, anti-friction bearings and multiple roll guides. The machine is designed and built to our usual high standards.

Exceedingly versatile and efficient machine.

THE EDMANDS CO., 228 ABORN STREET PROVIDENCE 3, R. I.

All papers, except the Symposium on Wire Drawing, lubricants and the Mordica Memorial Lecture were published in **Wire and Wire Products** from October through December, 1954. These two features are published in January, 1955.

Hubbard Spool Expanding Plant

The Hubbard Spool Company, who moved its manufacturing facilities from Chicago to Garrett, Indiana three years ago is now constructing an additional 25,000 square feet of floor space. This will be in addition to the existing Plant, and it is expected that the new construction will be completed the latter part of December of this year. The additional space will be used for manufacturing facilities in order to allow the Hubbard Spool Company further expansion of types and sizes of spools and reels now being manufactured and will, in addition, permit further streamlining and more efficient operation of existing facilities. This company will produce, in its new space, in addition to its present line of returnable and nonreturnable shipping spools and reels, steel spools and reels for drawing and annealing purposes, a line of aluminum spools in both wrought and die cast construction. The additional space will make it possible for the company to take care of the increasing demands of the wire, wire rope and cable industry and the anticipated further requirements which will be needed as these industries expand their production to take care of the anticipated future economic growth of the country.

Bolt and Nut Concern Makes Sales Changes

Theodore I. Dunn, Jr., has been appointed assistant vice-president of eastern sales, **Russell, Burdsall & Ward Bolt & Nut Co.,** Port Chester, N. Y. His former duties as Pacific Coast sales manager for the company, will be assumed by **James M. Bell.**

(*Continued from page* 69)

ditives can have an effect on the heat agent, which is the measure of flexibility that you are thinking of, not the initial flexibility.

A Member: Jack, I believe you misheard one of the questions. That was: Do you place xylol in the same category with phenol?

You didn't understand it that way, did you? Didn't you think he said xylenol?

Dr. Loritsch: I thought he said xylenol. Xylol is not a phenol. Thank you, Bill.

Chairman Pudlak: Thank you, Dr. Loritsch. (Applause)

Our next paper on the program was I understand stimulated by the scarcity of tin, and the desire to do something about the old hot tin pot. Dr. A. E. Carlson, of the Engineering Service Laboratory, General Chemical Division, Allied Chemical & Dye Corporation, Edgewater, New Jersey, is going to present his paper on: "Electrotinning Copper Wire from the Stannous Fluoborate Bath." Dr. Carlson. (Applause)

Dr. Carlson presented his paper.

DISCUSSION

Chairman Pudlak: We are open for questions.

A Member: I have two questions. One, I gather that in this system, the current enters the plating bath and leaves through the cleaning bath; is that correct?

Dr. Carlson: You can enter it through the alkaline cleaning bath, and it goes out in the tin plating. You can, for thin deposits, do that. In the cleaning bath, the wire in the alkaline is positive and the wire in the plating bath is negative.

I might also add that it is often better, when you are plating heavy deposits, to attach separate contacts to the tinning tank, because there is where you want most of your current density to get better equalization, either by roller type contacts, or by heavy shoes chrome plated. The reason we chrome plate is to cut down the coefficient of friction. Ordinary copper, when continuously used, will cut through.

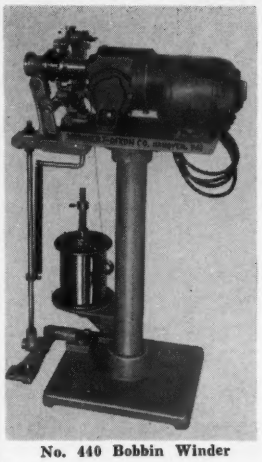
A Member: In any case, the cleaning current is the same as the plating current?

Dr. Carlson: It would if you took it for thin deposits. Normally, it is better to control the cleaning current so it doesn't get too high. It is best to do it with a separate rectifier. If it gets too high, you can overclean your wire and form cuprix oxide, which you can wipe off. That is why we have an acid pickle right after to take a lot of it off. It is preferable to have a low current in that section.

A Member: The second question is: Have you tried tinning any electro tinned strands by the high frequency method that is now coming on the market? Do you know what I mean?

One company is offering a high frequency tinning method which allows the strands of a stranded conductor to be tinned before the insulation is stripped off, by passing it through an induction coil.

NEW SINGLE BOBBIN WINDER
No. 440 FOR USE WITH
M-D WIRE LOOMS

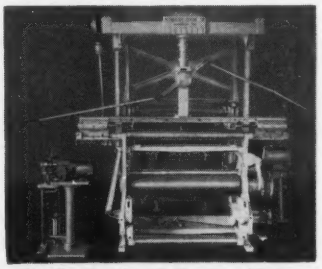


No. 440 Bobbin Winder

The winder shown at the left is designed to wind wire on bobbins as fast as the loom requires them. In fact, they will keep ahead of the loom's needs.

The winder is adjustable to bobbins of 3" or 4" in diameter and various widths of ½" to 1¼". Will wind a bobbin 3" diam. x 1" wide, of .011 wire in 8¼ minutes.

Traverse and wire guide are adjustable for any widths of movement desired. Will not pack wire so as to cause bobbin flange to bulge. The automatic stop is adjustable for any amount of fill required. The tail stock and other rollers have ball bearings.



Usually placed at L.H. side of loom.

The picture at the right shows the customary placement of the winder in juxtaposition with an M-D wire loom.

This small winder is carefully designed and made; needs only a minimum of attention.

Ask for descriptive circular No. 9953.

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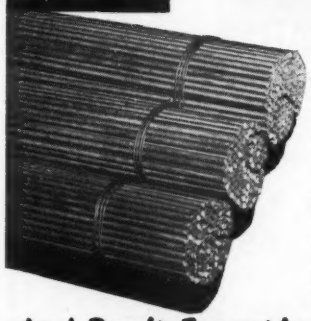

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Dr. Carlson: I'm not familiar with that.

A Member: It is tinned before the wire is stripped of its insulation.

Dr. Carlson: I don't know too much about that.

A Member: I think that what he is referring to is a heavy deposit of tin on copper wire. Then, by heating the wire with a high frequency current, you can cause the tin to reflow. Then, when you strip, you do not get the tendency of the strands to unravel.

Dr. Carlson: Oh! The question pertains to reflow.

A Member: The question is, sir: Has this electro tinned strand been tried in such an application?

Dr. Carlson: No, but I do know of such systems that use it. Some work pretty good and some don't. Lots of times, if they want a bright tin, people will die burnish it slightly. There might be some objection to some of those things—you are talking about induction?

A Member: Yes.

Dr. Carlson: I understand I recommended that to somebody, but because you cannot get much induced current in copper wire like you can in steel, it would be pretty hard to flow it.

A Member: How does the electro tinned wire meet that situation?

Dr. Carlson: I think it would flow.

A Member: If you have sufficient tin on.

Dr. Carlson: I don't know just what the minimum would be, but if you had it on too thick, you might get beading. But the idea is to flow it and quench it in cold water quickly, so you don't get any beading effect. The thinner deposits would probably flow a lot easier than the thicker ones, without running.

I didn't know that it had been done. I recommended that to somebody, but they claimed that because you couldn't get enough current in it, it would be terrific.

It is not like steel. They do that in sheet steel, I know. They electro tin a steel sheet to get a bright finish.

Chairman Pudlak: Are there any more questions?

A Member: Conduction heating works very well strand by strand, just by using two rollers and quenching in water. The question is: Is there a difference between this fluoborate process and the so-called Halogen process?

Dr. Carlson: Well, they are both acid baths, and I think the tin structure might be similar. We have found in the trade that our tin—I haven't compared it with Halogen tin, but we do know from other tins—the solubility of tin fluoborate deposits is tops. That was proved by a number of companies.

Another thing we can do: We can also lead-tin alloy plate the copper wire with these lead and tin fluoboric baths with anything from five per cent tin up to 70. That also has excellent solubility. That will be done shortly.

A Member: Do you have any idea what causes poor solubility?

Dr. Carlson: Yes. As a rule, it is an oxide film that collects on the tin during storage, and of course you can get any kind of these acid type fluxes that cut through it. But a lot of people in

the electronic industry do not want to use that type of flux. They use a resin type.

We have any number of baths for other purposes besides wire in the electronic industry, such as printed circuits. Maybe I shouldn't mention that here. We do plate lead-tin, and also on other electronic assemblies, where the lead-tin has excellent solubility—which is something that is really good to have.

A Member: Why is it that the tin deposited by this process is not as subject to oxidation as that deposited by the halogen process?

Dr. Carlson: Fluoborates, the salts themselves, are used in a lot of fluxes. I don't think you can get a hundred per cent rinsing and get every trace of acid off there. I think a thin film of fluoborate is still on there. That's why you get good solubility.

A Member: In plating wire that has been previously annealed, we find that the deposit of the wire drawing solution in the annealing furnace is difficult to clean. Have you any suggestions as to a better way of cleaning that?

Dr. Carlson: We have run into that situation, and what one company did was to employ ahead of the alkaline cleaning tank some kind of mechanical wipe—such as brushes. You can possibly change the alkali cleaner. That has to be for copper—for anodes.

Where drawing compounds are difficult to remove, the thing to do is to increase the length of the alkaline cleaning tank because when you are doing 500 feet a minute or 350 feet a minute, it is there but for a fraction of a second. So the thing to do in the line would be to add more alkali cleaning, and possibly more acid, because in any cleaning operation it is a heck of a lot harder to clean than to plate. If you can't get the wire clean, you can always get plate on it, but it doesn't stick.

You can make those changes. In some installations where wire is difficult to clean, cyanides are excellent copper cleaners. You can employ a little bit of cyanide in the bath, but a lot of people don't like to handle cyanide because of its toxicity.

The fluoborate ion is not a very toxic salt. It is inert. You would handle it like tin sulphate or tin chloride, or any other tin salt.

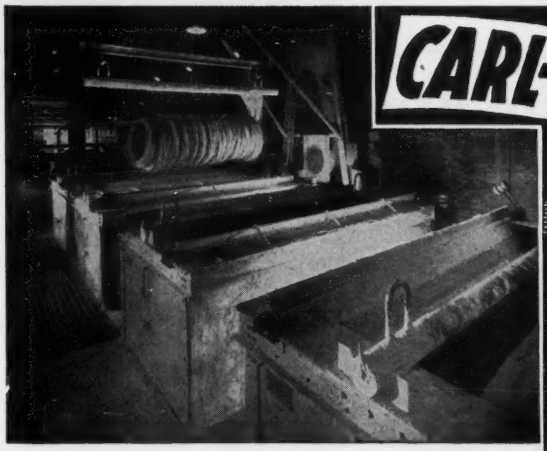
A Member: Is it going to be possible to add a small portion of antimony?

Dr. Carlson: You possibly could, but that poses another problem. You can plate a tin-antimony alloy, but since we specify high pure anodes, antimony is the worst poison for tin anode corrosion.

The only way you can incorporate antimony is to add antimony fluoborate and dribble it in the bath. You can plate antimony, because it has been done.

We have plated other alloys in this bath. And so we plate a lead-tin-copper alloy and we plate a lead-tin-antimony alloy. But antimony is a more noble metal than tin, and it tends to cement out on your anode, and you would have a problem of anode sludging—but it can be done.

A Member: Have you any reason to think that your lead-tin alloy will suit the government people with regard to this matter of reversion of tin in low temperatures?



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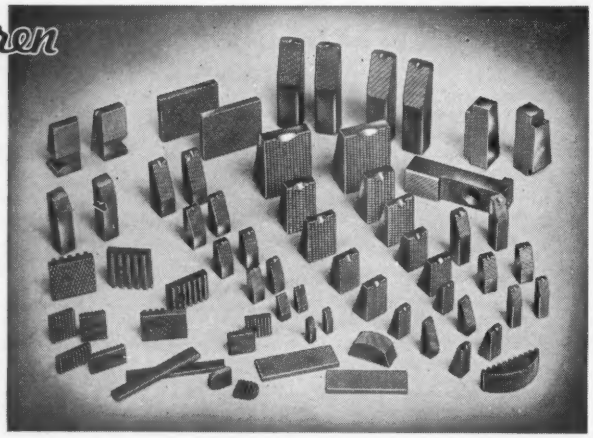

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Dr. Carlson: No, I don't think lead probably would do that. I understand the tendency is also to put in bismuth, isn't it, to prevent reversion?

A Member: I said antimony—possibly I meant bismuth.

Dr. Carlson: I don't think it depends upon the agent. Leaded tin would probably be less. But we do know this: I haven't run any tests on that to know exactly, but we do know that lead-tin alloy is harder in structure than one put on by hot dip. I don't know too much about the government specifications.

That is for low temperature work that you are talking about, where you get the seasoning of tin.

A Member: The reason I asked that, it looks as though it would become a serious problem in the wire industry, and if electrotinning is going to go anywhere, it is going to have to take care of that problem.

Dr. Carlson: That will be a tough hurdle, I will agree. But there is going to be a lot of tin plated wire for other purposes than lead-tin.

A Member: What are the functions of the addition agents?

Dr. Carlson: Like all acid tin solutions, no tin bath will function without an addition agent. We all have them. Without them, you would get a bunch of loose tin needles, which would just slop off. They function to control grain size.

Competent addition agents are high protein compounds, like gelatin, which give you that grain size, and beta naphthol, which gives you a good throw and also improves grain size.

Small amounts do co-deposit with the tin, but they are quite small.

The catochol, as I said before, has to be added periodically to cut oxidation to a minimum, because as I said before, stannic tin ions don't plate—they merely carry current.

A Member: Do I understand that you have a matte deposit when you get done?

Dr. Carlson: Yes, most deposits are matte. Most any acid tin bath, or any tin that I have seen, has been of a white matte finish. If you want a bright finish, they do usually lightly die burnish it.

A Member: Is that necessary?

Dr. Carlson: Some people, as I pointed out before, when coatings are put on wire for easy stripable material, might want it bright for that purpose.

A Member: But it isn't necessary?

Dr. Carlson: The deposit is not porous.

A Member: We always heat ours by induction, of course, but we thought it was a necessary thing in order to pass the sodium polysulphide test.

Dr. Carlson: I don't think it is, because wire is being plated now that is not heat flowing. There is a minimum I recommend for the test. Some people might go thinner. I think 30 millionths is the minimum I would go. Of course, lower thicknesses have passed, but for all safety, I think 30 millionths is about as low as you would want to go.

A Member: I might say we run about 30 millionths of conduction flow, and we never had a failure.

Dr. Carlson: That could be.

A Member: We think you can go to 15 millionths.

Dr. Carlson: It is all right with us.

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A Member: I think that Mr. Oldham commented a moment ago, and possibly the point was missed, with regard to the cold temperature properties of tin. I think he was talking about the conversion. I'd just like to make one comment on that. That is, that the tin zinc alloy cannot be transformed. That is an alloy of about 20 per cent tin.

I would like to ask Dr. Carlson one question. Why was anodic cleaning chosen when it is generally considered that cathodic cleaning is the better way to clean copper?

Dr. Carlson: Well, it all depends. Lots of times you can pull the dirt off wire by the various current methods, but you can, if you prefer, change it to cathodic if you think it is a better job. You are right, you can overclean a copper wire. The only danger in the cathodic method is that if you have any contamination in the alkaline cleaner, you are going to put that on the wire.

Chairman Pudlak: If there are no further questions, we will let Dr. Carlson go back to his seat. Thank you, Dr. Carlson. (Applause)

I think you will find the next paper on the program very interesting. Ever since man found that there were two metals, he would like to have one metal do the job of the other, only he was not willing to pay as much money as the more precious metal might be worth, so he decided to composite the two.

Ed Slick, the Supervising Engineer of Sylvania Electric Products, Warren, Pennsylvania, in presenting his paper on, "Composite Wires by Electroplating," will answer that question for you. Mr. Slick. (Applause)

. . . Whereupon Mr. Slick presented his paper . . .

DISCUSSION

Chairman Pudlak: We are open for questions.

A Member: I have three questions. What range of steel wire do you process when you nickelplate; how thick is the nickel; and what are the densities in the nickel fluoboric bath?

Mr. Slick: The first question: The size range of the wire will run approximately about .150 to I would say up to about .375.

The second question was what?

A Member: How thick is the nickel on that wire?

Mr. Slick: We feel that it is commercially feasible to plate thicknesses up to 15 per cent by weight. We have gone much higher than that.

A Member: What is that in inches, do you know?

Mr. Slick: I don't know offhand. On the article, there is a small graphic form that can be used to convert those.

A Member: The third question: What are the apparent densities you employ?

Mr. Slick: I think it depends largely on the conditions of your operation. There is quite a wide range available or that can be used. I would say anything from 75 amps up to perhaps 200.

Chairman Pudlak: Are there any further questions? I realize that this

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paper follows one on tinning and plating, so you may have run out of questions.

A Member: You didn't mention aluminumizing. I would like to know if you are doing anything, or if the process is applicable, or anything about it.

Mr. Slick: We have not plated aluminum on any of the base materials as yet. We have had several inquiries, and we have worked on it. We feel that this particular tank or method will lend itself well to the deposit of aluminum.

Chairman Pudlak: Are there any more questions? If not, I would like to thank you very much for your attendance, and thank you, Ed Slick, for your paper.

. . . At 11:30 o'clock a.m., the Non-Ferrous Section of the Wire Association recessed to reconvene at 2:00 o'clock p.m. of the same day . . .

TUESDAY AFTERNOON SESSION

November 9, 1954

. . . The Non-Ferrous Section reconvened at 2:00 o'clock p.m., Glenn J. Moher, Manager of Methods, Wire and Cable Section, Canadian General Electric Company, Peterborough, Canada, presiding . . .

Chairman Moher: Gentlemen, we have two very good papers this afternoon, both of them concerning polyvinyl compounds. The first paper will be presented by J. L. Foster, Product Engineer Plastic Materials, of the B. F. Goodrich Chemical Company, Cleveland, Ohio.

Mr. Foster is a graduate of Kansas State University in industrial chemistry, and he worked for seven years in the soap industry. For the last six or seven years, he has been working on Geon compounds for wire and cable insulation. Mr. Foster. (Applause)

. . . Mr. Foster presented his paper.

Chairman Moher: Thank you, Jim. Gentlemen, I think that was a very excellent paper, and I am sure that the greater benefit from this paper can be derived from the discussion. If there are any questions, I would like to have you direct them to Mr. Foster.

A Member: On your cold bend, using a mandrel, what do you find when you wrap it around its own diameter on cold bend?

Mr. Foster: The size of the mandrel you use is all important in that test. You can wrap these things around their own diameter if the temperature is down to minus 55 degrees centigrade, or in that range. The specific test that minus 85 was around a two inch diameter mandrel.

A Member: The 105 degree compound is still obtained by the use of the proper plasticizers. There is no implication or inference that a semi-rigidness is good for a higher temperature?

Mr. Foster: I didn't make that implication at all, Ben. You have got to take your plasticizers from the same standpoint as you would pick them in a flexible compound.

A Member: I think that the low temperature range would be extended, wouldn't it?

Mr. Foster: That again is something that is going to depend on the particular plasticizer system that you use.

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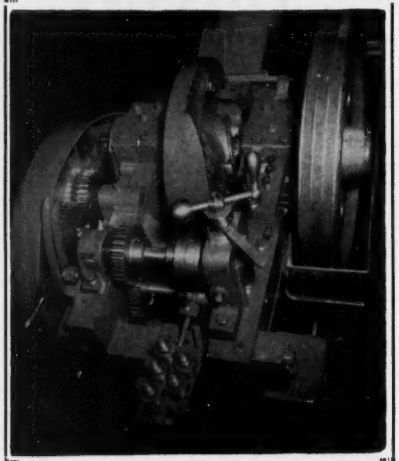

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Normally, in a plasticizer such as D.O.P., as you go down in plasticizer content, your low temperature properties become poor.

A Member: While you speak of a good low temperature characteristic relative to mandrel tests, how about impact?

Mr. Foster: I don't actually have too much data on impact tests. What we have gotten, I think they do follow the same pattern of improved low temperature properties, comparing the semi-rigid versus the normal compounds.

A Member: Taking a TW compound, how does that compare in price with a semi-rigid TW compound?

Mr. Foster: I can't give you a fair comparison now, because TW compounds are tremendous volume compounds. The semi-rigid compounds are so new in their application and so limited in their production that I don't think the final prices have been yet established. I don't think I can make a fair comparison at this time.

A Member: The productivity rates that you showed on that construction involving the 435 degree stock temperature, and so forth, I think you had a screw speed there of 16 rpm?

Mr. Foster: I think that is right, and a wire speed of about 15.

A Member: How does that productivity compare to a similar construction made with a more completely plasticized material?

Mr. Foster: In that particular table, I think you might have gotten double the rate with a softer compound.

A Member: There was no effort made to compare the productivity?

Mr. Foster: There was no effort made to make a direct comparison, no.

A Member: On work with military applications such as aircraft, you pointed out the excellent low temperature characteristics. Have we done anything in the area of studying fatigue from flexing at low temperatures, comparing the semi-rigid and rigid compounds?

Mr. Foster: Some work is underway at the moment. I don't have any data on such comparisons.

I think, on the average, you would find the normal rigid compounds rather poor. As you get into the semi-rigid compounds, with the low temperature properties that we spoke of, I think they are going to look as good as the flexible compounds. But I don't have any data to justify that. Work is being done along those lines right now.

Chairman Moher: There seems to be no further questions. Thank you, Mr. Foster. (Applause)

The next paper is by Milton S. Greenhalgh, Supervisor of the Thermoplastic Insulation Unit, CM Laboratory. General Electric Company, Bridgeport, Connecticut. Mr. Greenhalgh has spent about twenty years in wire and cable insulations, and I am sure he has a wealth of information on that subject. (Applause)

. . . Mr. Greenhalgh presented his paper.

DISCUSSION

Chairman Moher: Are there any questions?

A Member: Have you had enough experience with dry blending on semi-rigid compounds to indicate any special types

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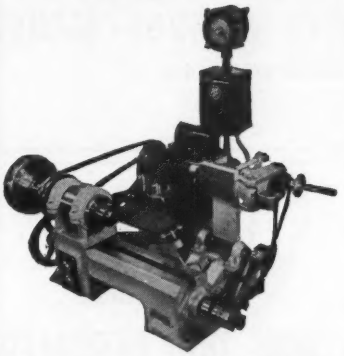

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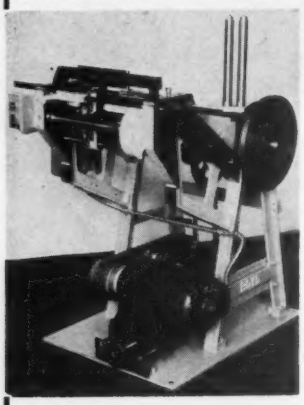

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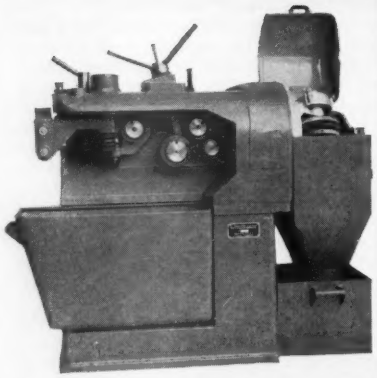

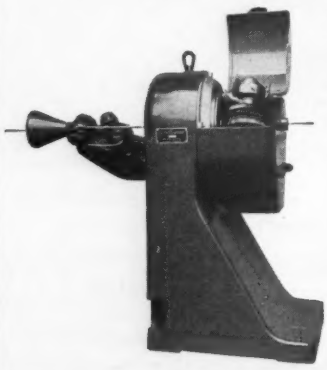

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of mixing equipment, or any special procedures with conventional mixing equipment, to get best results?

Mr. Greenhalgh: We have not had sufficient experience with dry blends on semi-rigids. What we have attempted to run—we have gone back, to be perfectly frank with you, to running from fused. As I pointed out, there are so many problems as Jim has pointed out here, such as heating the conductor and running into hot water, and so on, that we have kept away from the powder blend for the time being in running these wires. There is quite a heat built up in an extruder with these properties, and I think that most people agree that for the time being we will stick to fused material.

A Member: In your opinion, then, there are some limitations to dry blending, particularly with the polymeric plasticizers; is that correct?

Mr. Greenhalgh: I would say there are some limitations; and beyond that, I would say this: There are some limitations in the fused that we don't really understand as of today.

The reason I say that is because of this. In trying to track down some of the ideas which we had, we took a length of wire that we purchased on the open market which we knew had polymeric plasticizers and analyzed it. In testing that length of wire from one end to the other—it was 500 feet long—we split the middle, and it had 30 elongation tests that ranged all the way from 60 to 75 per cent, and then two-thirds of the wire down it went back to 100, and at the end it fell off to 65.

Now, most likely those people know how to run those polymeric plasticizers—I am assuming that they do—but I say there are some problems with the polymeric plasticizers.

A Member: In my experience with the polymeric plasticizers, particularly in the clear or transparent stock, I have found that the gel problem also comes up on extrusion with the cubic compound that is granulated, on occasion, providing that is consistent with the milling cycle of the fusing of the compound. While it apparently is thoroughly fused and homogeneous coming off the mill, granulated and extruded it still presents an appearance of gel particles. In other words, it isn't absolutely transparent.

That same material given a little longer cycle on the mill before granulating and extruding, comes out just as clear as crystal.

Mr. Greenhalgh: That is quite possible.

A Member: That would indicate, then, that even in dry blending, you could not get the time cycle working at the screw or breaker plate in order to thoroughly disperse polymeric plasticizers.

Mr. Greenhalgh: I think that is quite true. I will tell you another incident which is further evidence of the fact of dispersion, which is evident with plasticizers as well as pigments.

A number of years ago we were mixing in the Banbury a blue compound, and we had mixed this blue compound, and when it was dropped from the Banbury, it was gray—just as gray as anything.

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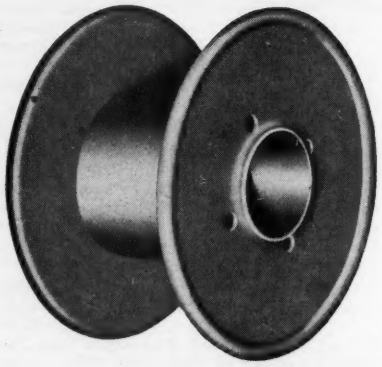

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Of course, as usual, you say, "Somebody put in the wrong pigment," or "somebody made the wrong weighing." The batch was rejected.

In those days, the batches used to be broken down in the mill again and fed to the extruder. I received a call that some very peculiar things were happening when this batch was being supposedly worked off in black stock, so as to cover up the grade, and so on. When this batch was re-broken down in the mill, it was just as bright and blue as the laboratory sample. That is nothing but a question of dispersion.

Also, I think you will find out, as Crater can probably tell you—I know he has had some experience with this—that these non-contaminating jackets, during World War II, in Banbury mixing with G-25 plasticizers, you could get cold temperature griddle points anywhere you wanted by how long you worked the compound in the Banbury.

In most cases, though, I'll tell you this: Once the gels are formed, it is pretty tough to get rid of them. They are in the same category of extruding nylon. Nylon is extruded say through 100 mesh screens and several 80 mesh screens, the reason for that of course being that the nylon is a melt. Once it melts down, the small granules in there have a tendency, through a single hundred mesh screen, to go through and reform on the other side. That is what happens to gels. Sometimes you can break them down.

Usually, with your method—in throwing it back in the mill—you got what we got in the blue compound. You got another breakdown. That is correct.

A Member: In attempting the application of a vacuum, in what part of the extruder do you suggest that be applied?

Mr. Greenhalgh: We will say that this is the barrel of the extruder. The opening is somewhere in here. The vacuum is put here with the feed hole here. There is an opening here.

A Member: There recently appeared an ad in one of the journals reporting a certain mixer in which it was claimed that you could save five to fifteen cents a pound in dry blend mix, and extrude 25 per cent faster. What are your notions on that?

Mr. Greenhalgh: There is only one basic way you can cut the price of the compound. I am going on the idea that the normal mixing costs are in the neighborhood of two to five cents a pound. To cut those five to fifteen cents a pound is quite a cut. The only other way you can cut the compound is of course to cheapen the ingredients.

I think that if you check into this, you will find that what is done in this particular case is the cost of the mixing equipment—the Banbury — is balanced against the mixing equipment in this particular case, and the liquidation is taken into consideration as a factor in which you get the cost, saving in that manner.

A Member: What about the temperature extrusion averages over the country? Have you heard any more about that—granule versus dry blend?

Mr. Greenhalgh: You mean for flexible types? I think the major thing on temperature extrusion is that for dry

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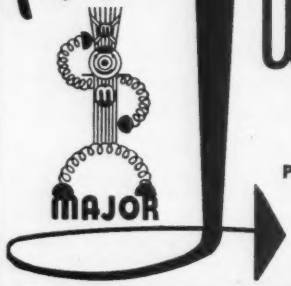

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blend you have to have a finer temperature control than you have to have for fused material. I think that is important. The temperature control on machines is something I don't like to talk about too much anymore, because I have come to a conclusion that one thing you have to go by is compound temperature.

You find that out in a number of cases, running these new types of materials such as the fluoranthene resins, and such, you find out that temperatures on the machine don't mean much. It is what the compound temperature is. It is the compound temperature that counts. You have got to control that temperature.

A Member: When I said temperature, I meant speed of extrusion—one versus the other.

Mr. Greenhalgh: There is a thought that the dry blend is going at a faster rate. But I say that in this particular case, one has to take into effect quality —so I don't think you can make a direct comparison in some cases.

Are there any more questions? Okay; thank you. (Applause)

Chairman Moher: Mr. Greenhalgh entitled his paper, "Controversial." It didn't seem to end up that way.

The next item is a motion picture shown through the courtesy of the Rome Cable Corporation entitled, "Cable — Pathway to Power."

. . . Motion picture presented . . .

Chairman Moher: Gentlemen, that completes this afternoon's program.

. . . At 4:00 o'clock p.m., The Non-Ferrous Section of The Wire Association adjourned to reconvene Wednesday, November 10, 1954, at 9:30 o'clock a.m. . . .

WEDNESDAY MORNING SESSION

November 10, 1954

. . . The Non-Ferrous Section of the Wire Association reconvened at 9:30 o'clock a.m., Grayson B. Wood, Jr., Mill Product Engineer, Scovill Manufacturing Company, Waterbury, Connecticut, presiding . . .

Chairman Wood: If you will be seated, please, we will get this session underway.

Chairman Wood: Our speaker for this morning, Phillip J. Croft, from the Canada Wire & Cable Company, will speak on the subject "The Application of Wire and Cable to a Wire and Cable Plant." (Applause)

. . . Mr. Croft presented his paper.

DISCUSSION

Chairman Wood: Thank you very much, Mr. Croft.

I would like to throw the meeting open for questions. If anyone has a question, would you please stand and give your name, your company affiliation and then the question.

A Member: I noticed in some of the pictures that you had taken branches off the circuits. Is there some fancy method of tapping on a branch to one of those lines?

Mr. Croft: There is nothing at all fancy about it. The material can be considered as a tight fitting aluminum conduit.

The method normally used for making a branch is to run the material by means of the termination fitting into either a counterlet or to a box. We have developed the use of two general types of fitting for terminating the aluminum sheathed cable either into a counterlet or into a box or other standard enclosure.

For normal applications where there is no undue amount of moisture, and where a moisture-proof connection is not required, the ordinary line of fittings used with corrugated armor type BX cable are satisfactory and are, for the most part, accepted by our Canadian Code Authorities.

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I should point out that there we have the 2-conductor flat type as well as the circular. Where the moisture-proof connection is required, we make use of the circular type of cable and a gland which is, in effect, a split cone, and a screw that tightens it up, tightening the whole thing against a neoprene gasket which gives a moisture-proof fitting.

I should point out also that the conductors within the aluminum sheathed cable—that is speaking of the type of aluminum-sheathed cable used for ordinary plant wiring in which there are rubber insulated or plastic insulated legs—the insulated legs emerge from the insulated sheath as a fully-approved code type of material so that as soon as the sheath is terminated, you have inside your box just the perfectly ordinary wires into which you make a connection and insulate it in the normal way.

Chairman Wood: Are there any other questions?

Mr. Croft has also brought with him a picture depicting "Copper, Mined to Finished Products."

. . . Motion picture shown . . .

Mr. Flood: This brings to the end our Non-Ferrous program for this year. We want to thank the Canada Wire & Cable Company for the use of the motion pictures, and Mr. Croft for his very fine paper.

. . . At 11:05 o'clock a.m., The Non-Ferrous Section of The Wire Association was closed.

Trains Distributor Salesmen to Meet Competition

Equipping its distributor organization to cope with today's highly competitive industrial market was the objective of **Firth Sterling's** sales training course, November 15, 16 and 17. The program consisted of sales courses on tool steels and sintered carbide, utilizing skits to demonstrate how salesmen can meet competition. Fourteen salesmen, representing nine authorized distributors, attended the course conducted by Firth Sterling sales and technical personnel.

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Conducting the discussions for Firth Sterling were **C. C. Krogh,** Manager, Distributor Sales; **E. W. Kalb,** Manager, Steel Sales; **M. L. Backstrom,** Ass't. Manager, Carbide Sales; **J. J. Sowko,** Manager, Pittsburgh District Sales; **J. Gabrenas,** Ass't. Chief Engineer; **S. F. Madden,** Distributor Sales; **F. Cellier,** Research; and **T. E. Pickering,** Sales Training Director.

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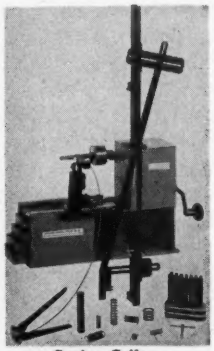

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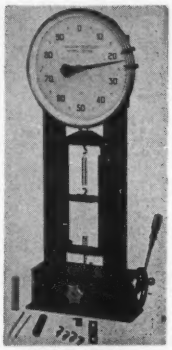

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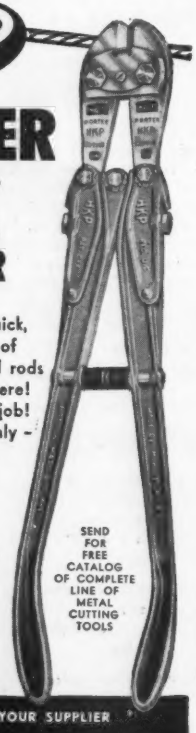

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The Jack Mordica Story

(*Continued from page* 45)

people reported, "It was Jack's friendly attitude and his generosity in spending a great deal of time in helping customers with their problems that prompted the customers to be very understanding and cooperative. Another feature that was of great assistance in developing good will was the great respect the wire mill operators had for Jack's opinion. They were always eager to ask questions concerning their wire drawing problems and Jack was always honest and frank in his answers and I have noticed that many of them acted immediately upon his suggestions and usually results showed improvement in the customer's product."

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Selling for Jack had been a natural bent. He had worked at it all his life and his talents improved as he grew older. It may have started in his younger days selling himself to his family and friends, playing Santa at Christmas or dyeing eggs at Easter or building hammocks for the kids in the sum-

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mer time. He gained experience by selling scales for his brother-in-law back in the middle west during off-periods from the mill. And he often liked to tell of his selling experience in Kenova, West Virginia, where he and his partner, during times when the mill was idle, would head for the hills to sell picture frames and enlargements, how they would take the orders on their first trip through the mountains and then retrace their steps a few weeks later to deliver the finished product. Jack was not only learning to sell but was getting first hand information on how to make his product stick.

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Jack's greatest attribute was salesmanship, his greatest asset was the respect people had for his ability and their confidence in his judgment. It was a rare combination and Jack had used it well. It is still evident in every corner of the plant he started nearly thirty years ago as well as in the minds of all who knew and worked for him. It spelled progress and improvement. It meant increased facilities and new processes—tungsten carbide dies—continuous machines or a Bethanizing unit installed in the height of the depression. It meant increased production and improved quality. All of this belonged to Jack. He had played the game well — had not only managed the team but he had pitched a no-hit game and batted in all the runs.

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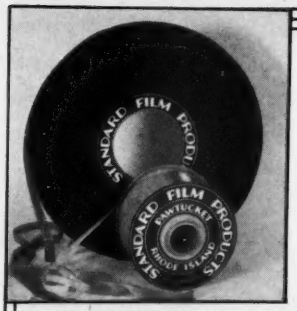

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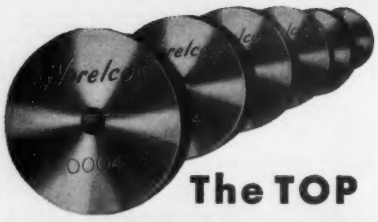

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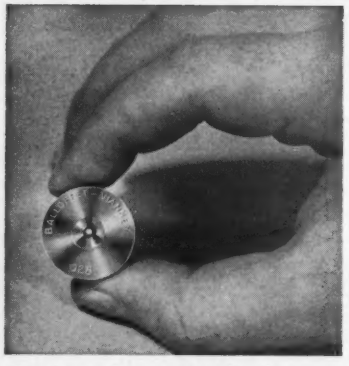

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A new, 8-page booklet published by **Waterbury Farrel Foundry & Machine Co.**, Waterbury, Conn., covers the company's line of tandem mills used for high speed reduction of non-ferrous and ferrous rod.

★ ★ ★

The bulletin, printed in two colors, includes many illustrations showing various sizes of WF tandem rod mills plus work samples and a cross-sectional reduction sequence. The text discusses the advantages of reduction by rolling and describes the function and application of the Farrell mills. Details are given of WF design and construction features which are factors in reducing operating costs. The pay off unit, straighteners, coilers and cooling method are discussed, in addition to the mill operation itself. A tabularized chart gives capacities and other data on various sizes of WF tandem mills which the company has built.

★ ★ ★

A partial list of wire mill equipment and other metal-working equipment built by Waterbury Farrel is also included.

★ ★ ★

Free copies of this new booklet can be obtained from Waterbury Farrel Foundry & Machine Co., Waterbury, Conn., by requesting circular 729-R.

New Automatic Feed Bench Model Wire Straightener

Mettler Machine Tool, Inc., New Haven, Conn., announces a new member to the well known line of SHUSTER wire straighteners. This self-feeding, rotary straightener is exceptionally sturdy and compact, measuring only 16" for its longest dimension. Designed as the answer for small shop requirements of straightening fine wire, pilot models have already been endorsed by larger users of wire as a

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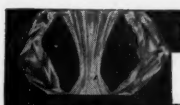
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Opens New Multi-Purpose Hot Rolling Mill

The Carpenter Steel Company of Reading, Pa., has put into operation a new hot rolling mill which, for the first time, makes possible the production of strip, rods and bars on one combined mill layout.

★ ★ ★

Carpenter President **Frank R. Palmer** announced that the new mill was specially designed and laid out to meet all the exacting requirements involved in producing a wide range of specialty steel products, including tool, stainless and alloy steels.

★ ★ ★

Besides offering a unique production flexibility, the multi-purpose mill incorporates improved heating facilities that aid in controlling surface decarburization. All reheating furnaces—both continuous and batch type—are oil-fired and equipped with automatic controls.

★ ★ ★

To help develop uniform grain structure, all bars produced on this mechanized mill are individually cooled on a notched bar cooling bed. This controlled cooling does not, however, replace the annealing treatment which is performed as a later operation.

★ ★ ★

The unique layout of the mill enables the company to substantially reduce downtime during roll

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changes. Facilities are so arranged that rolls can be changed in one part of the mill while operations continue uninterrupted on other stands. This saving in downtime affords an unusual flexibility in the handling of many different grades and sizes of steel. It is particularly important in handling the multitude of small orders (i.e. from 1,000 to 15,000 lbs.) which are so typical of the specialty mill output.

GE Makes Tungsten and Molybdenum Available

General Electric has announced plans to make its pure tungsten and molybdenum products generally available on the open market. These products in the past have been offered outside the company only to a limited extent.

★ ★ ★

The announcement was made by **Herman L. Weiss,** manager of the company's **Cleveland Wire Works,** who said he had appointed **John W. Forbes** to his organization to implement the plant's new sales policy. Mr. Forbes, formerly assistant manager of **Cleveland Tungsten, Inc.,** will have responsibility for all marketing operations involving the plant's pure tungsten and molybdenum products. He will make his headquarters at the plant, at 1331 Chardon Road, Euclid, Ohio.

★ ★ ★

Tungsten and molybdenum are increasingly important to the national economy, according to Weiss. He predicted that efforts of scientists to "break through the temperature barrier" will open many new fields for these metals.

★ ★ ★

Tungsten currently is used for electric lamp filaments, carbide cutting tools, grids in electronic tubes, electric contacts, welding electrodes, metallizing filaments, and others. Pure molybdenum is used in various forms as parts for electric lamps and electronic tubes and equipment.

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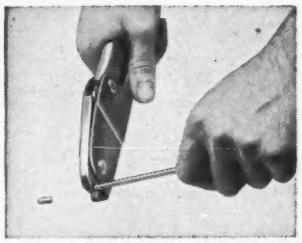

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Danforth, The C. W. Co., Youngstown, Ohio
Elgin National Watch Co., Abrasives Div., Elgin, Ill.
Hyprez Div., Engis Equipment Co., Chicago, Ill.
Indiana Wire Die Co., Ft. Wayne, Ind.
National Research Company, St. Clair Shores, Mich.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Union Wire Die Corp., New York, N. Y.
United States Industrial Diamond Corp., New York, N. Y.
Universal Wire Die Co., Cranford, N. J.
Wayne Wire Die Co., Hillside, N. J.

DIAMOND POWDER RECLAIMING—
Danforth, The C. W. Co., Youngstown, Ohio
Kay & Warren Co., Brooklyn, N. Y.
National Research Co., St. Clair Shores, Mich.
Rusch Wire Die Corp., Croton-on-Hudson. N. Y.
Union Wire Die Corp., New York, N. Y.

DIAMOND TOOLS—
Indiana Wire Die Co., Ft. Wayne, Ind.
Metal Carbides Corporation, Youngstown, Ohio
Universal Wire Die Co., Cranford, N. J.
Wayne Wire Die Co., Hillside, N. J.

DIES—Carbide, Tungsten & Tantalum
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J., Inc., New York, N. Y.
Carboloy Dept. of General Electric Co., Detroit.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelloy Corporation, New York, N. Y.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Union Wire Die Corp., New York, N. Y.
Universal Wire Die Co., Cranford, N. J.
Vascoloy-Ramet Corp., Waukegan, Ill.
Wayne Wire Die Co., Hillside, N. J.

DIES—Cold Heading
Carboloy Dept. of General Electric Co., Detroit
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Indiana Wire Die Co., Ft. Wayne, Ind.
Metal Carbides Corporation, Youngstown, Ohio
Vascoloy-Ramet Corp., Waukegan, Ill.

DIES—Diamond
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J., Inc., New York, N. Y.
Cochaud Wire Die Inc., New York, N. Y.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Indiana Wire Die Co., Ft. Wayne, Ind.
Kelloy Corporation, New York, N. Y.
Kelly Wire Die Corp., New York, N. Y.
National Wire Die Co., New York, N. Y.
New England Wire Die Co., Worcester, Mass.
North American Philips Co., Inc., Elmet Div., Lewiston, Me.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Union Wire Die Corp., New York, N. Y.
Universal Wire Die Co., Cranford, N. J.
Wayne Wire Die Co., Hillside, N. J.

DIES DIAMOND—Reversible
National Wire Die Co., New York, N. Y.

DIES—Extrusion
Carboloy Dept. of General Electric Co., Detroit.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Metal Carbides Corporation, Youngstown, Ohio
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Universal Wire Die Co., Cranford, N. J.
Wayne Wire Die Co., Hillside, N. J.

DIES—Eyelet
Eastern Carbide Corp., New Rochelle, N. Y.
Kelloy Corporation, New York, N. Y.
Kelly Wire Die Corp., New York, N. Y.

DIES—Nail, Nail Cutters, Feeder Blocks, Grippers, etc.
Firth Sterling, Inc., Pittsburgh, Pa.
Pittsburgh Carbide Die Co., Monongahela, Pa.

DIES—Pointing
Sjogren Tool and Machine Co., Auburn, Mass.

DIES—Repairs & Re-Cutting
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J., Inc, New York, N. Y.
Carboloy Dept. of General Electric Co., Detroit.
Cochaud Wire Die Inc., New York, N. Y.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Ft. Wayne Wire Die., Inc., Fort Wayne, Ind.
Indiana Wire Die Co., Ft. Wayne, Ind.
Kelloy Corporation, New York, N. Y.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corporation, Youngstown, Ohio
National Wire Die Co., New York, N. Y.
New England Wire Die Co., Worcester, Mass.
North American Philips Co., Inc., Elmet Div., Lewiston, Me.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Universal Wire Die Co., Cranford, N. J.
Vascoloy-Ramet Corp., Waukegan, Ill.
Wayne Wire Die Co., Hillside, N. J.

DIES—Special Shapes, Etc.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Indiana Wire Die Co., Ft. Wayne, Ind.
Union Wire Die Corp., New York, N. Y.

DIES—Swaging
Sjogren Tool and Mach. Co., Inc., Auburn, Mass.

DIES—Tube Drawing
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Carboloy Dept. of General Electric Co., Detroit.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelloy Corporation, New York, N. Y.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Vascoloy-Ramet Corp., Waukegan, Ill.

DRAW BENCHES—
(See MACHINERY—Draw Benches)

DRUMS—Wire Packaging
Continental Can Company, Ven Wert, Ohio

DRUMS & TRAVERSES—For Cable Reels
Hubbard Spool Co., Garrett, Ind.
New York Engineering Co., Yonkers, N. Y.
Republic Steel Corp., Pressed Steel Div., Niles, Ohio

DRYING EQUIPMENT
Carl-Mayer Corp., The, Cleveland, Ohio
Industrial Ovens, Inc., Cleveland, Ohio.
Rockwell, W. S. Co., Fairfield, Conn.

ENGINEERS—Consulting
Lubricants—Hans C. Bick, Inc., Reading, Pa.
Wire Mill—Clarence S. Arms, Worcester, Mass.
Seymour, Leroy D., Trenton, N. J.
Zinc—Imhoff, Wallace G. Co., Los Angeles, Calif.

EYELETS—Brass or Zinc
Platt Bros. & Co., The, Waterbury, Conn.

FENCING & FENCES—Wire
Interlocking Fence Co., Morton, Ill.

FILM—Insulating
Standard Film Products Corp., Pawtucket, R. I.

FOAM PRODUCING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Parkin Chemical Co., The, Pittsburgh, Pa.

FURNACES—Brazing
Electric Furnace Co., Salem, Ohio
Rockwell, W. S. Co., Fairfield, Conn.

FURNACES—Galvanizing Equipment
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio
Rockwell, W. S. Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio
Wilson, Lee, Engr. Co., Cleveland, Ohio

FURNACES—Heat Treating
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl Mayer Corp., The, Cleveland, Ohio
Electric Furnace Co., Salem, Ohio
Drever Company, Phila., Pa.

WHERE TO BUY, Continued

For more complete information, consult the annual Wire and Wire Products Buyers' Guide.

Rockwell, W. S., Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio
Wilson, Lee, Engr. Co., Cleveland, Ohio

FURNACES—Lead Melting
Electric Furnace Co., Salem, Ohio
Rockwell, W. S. Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio

FURNACES—Pot (oil, gas, electric)
Ajax Electric Co., Inc., Philadelphia, Pa.

FURNACES—Resistance Heating, Strand
(See Annealing Machines)

FURNACES—Salt Bath
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio
Rockwell, W. S. Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio

GALVANIZING EQUIPMENT — (See MACHINERY—Galvanizing Wire)

GRINDERS—Roll
Norton Co., The, Worchester, Mass.

GUIDES—For Wire
Heany Industrial Ceramic Corp., New Haven, Conn.

GUIDE TIPS—For Extruding Machines (See NOZZLES)

HAMMERS—Nail Heading
Firth Sterling, Inc., Pittsburgh, Pa.
Pittsburgh Carbide Die Co., Monongahela, Pa.

HAMMERS—Swaging
Sjogren Tool and Machine Co., Auburn, Mass.

HARDSURFACING ALLOYS—
(See Alloys—Hardsurfacing)

HOOKS—Pickling & Liming
Youngstown Welding & Eng'g Co., Youngstown, Ohio

HOISTS—Electric Travelling
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio

INHIBITORS—Pickling
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Parkin Chemical Co., The, Pittsburgh, Pa.

INSULATING MATERIALS—
Carbro Chemical Company, Pawtucket, R. I.
Celanese Corporation of America, New York, N. Y.
Chemical Products Co., E. Providence, R. I.
Electronic Rubber Co., Stamford, Conn.
Heineman Corp., Oscar, Chicago, Ill.
Merrimac Paper Co., New York, N. Y.
Pittsburgh Plate Glass Company, Pittsburgh, Pa.
Plymouth Cordage Company, Plymouth, Mass.
Standard Film Products Corp., Pawtucket, R. I.

INSULATING MATERIALS — Paper—For Electric Wire Cable
Merrimac Paper Co., New York, N. Y.
Plymouth Cordage Company, Plymouth, Mass.

LACQUERING SYSTEMS — See MACH.—Lacquering Electric Wire

LACQUERS—For Electric Wire
Chemical Products Co., E. Providence, R. I.

LAME—LAHN—
Montgomery Co., The, Windsor Locks, Conn.

LIME—
Warner Co., The, Philadelphia and Bellefonte, Pa.

LUBRICANTS — For Metal Cutting, Stamping and Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Miller, R. H., Co., Inc., Homer, N. Y.
Nopco Chemical Co., Harrison, N. J.
Standard Industrial Compounds Co., Chicago.

LUBRICANTS—Wire Drawing
(See Compounds—Wire Drawing)

LUBRICANTS—Wire Rope
Swift & Co., Chicago, Ill.

MACHINERY—Armoring (Cable, Wire, Hose)
American Insulating Mach'y Co., Phila., Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc., (used), Pawtucket, R. I.

MACHINERY—Barbed Wire
Glader Wm., Machine Works, Chicago, Ill.
Wafios, Maschinenfabrik, Reutlingen 3, Wurtt., Germany

MACHINERY—Braiding
Fidelity Machine Co., Inc., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Wardwell Braiding Mach. Co., Central Falls, R. I.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Bunching
Cook Manufacturing Co., The, Paterson, N. J.
Edmands Company, The, Providence, R. I.
Haskell-Dawes Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Cable, Electric
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Inc., Philadelphia, Pa.
Haskell-Dawes Machine Co Philadelphia, Pa.
New England Butt Co., Providence, R. I.
New York Engineering Co., Yonkers, N. Y.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Capstans (See Machinery—Winding Wire)

MACHINERY—Centerless Grinding
Schumag Schumacher Metallwerke, Aachen, Germany.

MACHINERY—Chain Making
Cosa Corporation, New York, N. Y.
Nilson, A. H. Machine Co., Bridgeport, Conn.
Wafios, Maschinenfabrik, Reutlingen 3, Wurtt., Germany

MACHINERY—Closing Rope
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Watson Machine Co., Paterson, N. J.

MACHINERY—Coiling Rod
Vaughn Mach'y Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Cold Heading
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Copper Wire Drawing
Aetna-Standard Engineering Co., Pittsburgh.
American Insulating Mach'y Co., Phila., Pa.
National Mach'y Exch. (Used), New York.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Covering Wire (See MACHINERY—Insulating Wire)

MACHINERY—Crimping Wire
Cedar West Tool Co., New York, N. Y.

MACHINERY—Cutting
Eisler Engineering Co., Newark, N. J.
Lewis Machine Co., The, Cleveland, Ohio
Mettler Machine Tool, Inc., New Haven, Conn.
Utica Drop Forge & Tool Corp., Utica, N. Y.
Wells, Frank L., Co., Kenosha, Wis.

MACHINERY—Descaling Rod, Dry
Fisher Associates, New York, N. Y.
Herborn, Herborn, Germany.

MACHINERY—Die Making
Boulin, Victor J., Inc., New York, N. Y.
Carboloy Dept. General Electric Co., Detroit, Mich.
Dykrex Corp., Roos Tool & Mfg. Div., Newark, N. J.
Firth Sterling, Inc., Pittsburgh, Pa.
International Wire Products Co., Midland Pk., N. J.
Kelloy Corporation, New York, N. Y.
Kelly Wire Die Corp., New York, N. Y.
Nord International Corporation, Orange, N. J.
Union Wire Die Corp., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.

MACHINERY—Draw Benches
Morgan Construction Co., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Electrode Grinding
Cosa Corporation, New York, N. Y.

MACHINERY—Edging (See MACHINERY — Tandem Rolling and Edging Mills)

MACHINERY—Enameling
American Insulating Mach'y Co., Phila., Pa.
Cook Manufacturing Co., The, Paterson, N. J.
Industrial Ovens, Inc., Cleveland, Ohio
International Wire Products Co., Midland Pk., N. J.
Rockwell Co., W. S., Fairfield, Conn.

MACHINERY—Extruding
Aetna-Standard Engineering Co., Pittsburgh.
Davis-Standard Sales Corp., Mystic, Conn.
Royle, John, & Sons, Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Fence
Blashill and Company, Arthur, Worcester, Mass.
Glader, Wm., Machine Works, Chicago, Ill.
Interlocking Fence Co., Morton, Ill.

MACHINERY—Filament Coil Winding
Eisler Engineering Co., Newark, N. J.

MACHINERY—Flat Wire
Mettler Machine Tool, Inc., New Haven, Conn.
Torrington Mfg. Co., Torrington, Conn.

MACHINERY—Forming Wire
Baird Machine Co., Stratford, Conn.
Karl Hack, Reutlingen (Wurtt), Germany
Nilson, A. H., Machine Co., Bridgeport, Conn.
Wafios, Maschinenfabrik, Reutlingen 3, Wurtt., Germany

MACHINERY—Fourdrinier Looms
Cedar West Tool Co., New York, N. Y.

MACHINERY—Galvanizing Wire
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio
Vaughn Machinery Co., Cuyahoga Falls, O.
Wilson, Lee, Engr. Co., Cleveland, Ohio

MACHINERY—Gang Winders
Entwistle, Jas. L. Co., Providence, R. I.
International Wire Products Co., Midland Pk., N. J.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Karl Hack, Reutlingen (Wurtt), Germany
Norton Co., The, Worcester, Mass.

MACHINERY—Insulating Wire
Aetna-Standard Engineering Co., Pittsburgh, Pa.
American Insulating Mach'y Co., Phila., Pa.
Davis-Standard Sales Corp., Mystic, Conn.
Fidelity Machine Co., Inc., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Pourtier Pere et Fils, Romainville (Seine), France
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Wardwell Braiding Mach. Co., Central Falls, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Knitting
Fidelity Machine Co., Inc., Philadelphia, Pa.

MACHINERY—Lacquering Electric Wire
American Insulating Mach'y Co., Philadelphia.
Cook Mfg. Co., The, Paterson, N. J.
Industrial Ovens, Inc., Cleveland, O.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Looms, Wire Weaving
Cedar West Tool Co., New York, N. Y.
Interlocking Fence Co., Morton, Ill.
Mummert-Dixon Co., Hanover, Pa.
Wafios, Maschinenfabrik, Reutlingen 3, Wurtt., Germany

MACHINERY—Material Handling
(See Material Handling Equipment)

MACHINERY—Measuring Wire & Cable
Durant Mfg. Co., Milwaukee, Wis.
New England Butt Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack
Baird Machine Co., The Stratford, Conn.
Glader, Wm., Machine Works, Chicago, Ill.
National Mach'y Exch. (Used), New York, N. Y.
Seybold Transworld Exporters, New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Wafios, Maschinenfabrik, Reutlingen 3, Wurtt., Germany

MACHINERY—Packaging Wire
Coulter & McKenzie Machine Co., Bridgeport, Conn.

MACHINERY—Pickling
Chemsteel Construction Co., Pittsburgh, Pa.
Youngstown Welding & Eng'g Co., Youngstown, Ohio.

MACHINERY—Pin Making
Baird Machine Co., The, Stratford, Conn.
Cosa Corporation, New York, N. Y.

MACHINERY—Pointing
Aetna-Standard Engineering Co., Pittsburgh, Pa.
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used). New York.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury Conn.

MACHINERY—Poultry Wire Fencing
Interlocking Fence Co., Morton, Ill.

MACHINERY—Re-Spooling
Boyd & Sons Manufacturing Corp., Philadelphia, Pa.
Cedar West Tool Co., New York, N. Y.
Eisler Engineering Co., Newark, N. J.
Emory, Robert J., Co., Newark, N. J.
International Wire Products Co., Midland Pk., N. J.
Mummert-Dixon Co., Hanover, Pa.
National Mach'y Exch. (Used), New York, N. Y.
Steel Equipment Co., Cleveland, Ohio
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

WHERE TO BUY, Continued

For more complete information, consult the annual Wire and Wire Products Buyers' Guide.

Wire Insulating Machy., Div. of Machinery Electrification, Inc., Northboro, Mass.

MACHINERY—Rod Mill
Morgan Construction Co., Worcester, Mass.
Schumag Schumacher Metallwerke, Aachen, Germany

MACHINERY—Rolling Mill
Morgan Construction Co., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Rubber Insulating
Davis-Standard Sales Corp., Mystic, Conn.
Royle, John & Sons, Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Serving
Fidelity Machine Co., Phila., Pa.
Pourtier Pere et Fils, Romainville (Seine), France
Wardwell Braiding Machine Co., Central Falls, R. I.

MACHINERY—Spark Testing
Peschel Electronics, Inc., New Rochelle, N. Y.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Spring Making
Carlson Company, The, New York, N. Y.
Karl Hack, Reutlingen (Wurtt), Germany
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wafios, Maschinenfabrik, Reutlingen 3, Wurtt., Germany
Wells, Frank L., Co., Kenosha, Wisc.

MACHINERY—Spring Testing
Emmericher Maschinenfabrik, Emmerich, Germany

MACHINERY—Staple
Seybold Transworld Exporters, New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Wafios, Maschinenfabrik, Reutlingen 3, Wurtt, Germany.

MACHINERY—Straightening & Cutting
Continental Fdy & Machine Co., Medart Division, Pittsburgh, Pa.
Cosa Corporation, New York, N. Y.
Lewis Machine Co., The, Cleveland, Ohio
Mettler Machine Tool Co., New Haven, Conn.
National Mach'y Exch. (Used), New York, N. Y.
Wells, Frank L., Co., Kenosha, Wisc.

MACHINERY—Stranding
Haskell-Dawes Machine Co., Philadelphia, Pa.
Milton Machine Works, Inc., Milton, Pa.
New England Butt Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Studmaking
Cosa Corporation, New York, N. Y.

MACHINERY—Swaging
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Take-Up and Pay-Out
Aetna-Standard Engineering Co., Pittsburgh, Pa.
American Insulating Mach'y Co., Phila., Pa.
Blashill and Company, Arthur, Worcester, Mass.
Davis-Standard Sales Corp., Mystic, Conn.
Industrial Ovens, Inc., Cleveland, Ohio
International Wire Products Corp., Midland Park, N. J.
New York Engineering Co., Yonkers, N. Y.
Standard Mill Supply Co., Pawtucket, R. I.
Watson Machine Co., Paterson, N. J.
Wire Insulating Machy., Div. of Machinery Electrification, Inc., Northboro, Mass.

MACHINERY—Taping
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Pourtier Pere et Fils, Romainville (Seine), France
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Testing Magnet Wire Coatings for Pin Holes
Peschel Electronics, Inc., New Rochelle, N. Y.

MACHINERY—Testing, Physical
Emmericher Maschinenfabrik, Emmerich, Germany
Scott Testers, Inc., Providence, R. I.

MACHINERY—Tinning Wire
American Insulating Mach'y Co., Phila., Pa.
Cook Manufacturing Co., The, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y Co., Phila., Pa.
International Wire Products Corp., Midland Park, N. J.

MACHINERY—Trolley Wire
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill, Cold Drawing
Aetna-Standard Engineering Co., Pittsburgh, Pa.
Mettler Machine Tool, Inc., New Haven, Conn.

MACHINERY—Twinning
(See Mach.—Bunching)

MACHINERY—Twisters, Wire
Cook Manufacturing Co., The, Paterson, N. J.
Edmands Company, The, Providence, R. I.
Haskell-Dawes Machine Co., Philadelphia, Pa.
International Wire Products Corp., Midland Park, N. J.

MACHINERY—Used
National Machinery Exchange, New York, N. Y.
Wire & Textile Machy., Inc., Pawtucket, R. I.

MACHINERY—for Wire Welding
(See WELDERS—Butt and Spot)

MACHINERY—Washer Forming
Cosa Corporation, New York, N. Y.

MACHINERY—Winding Wire
Cedar West Tool Co., New York, N. Y.
Eisler Engineering Co., Newark, N. J.
Emory, Robert J., Newark, N. J.
Mummert-Dixon Co., Hanover, Pa.
New England Butt Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.
Watson Machine Co., Paterson, N. J.
Wire Insulating Machy., Div. of Machinery Electrification, Inc., Northboro, Mass.

MACHINERY—Wire Bending
Eisler Engineering Co., Newark, N. J.

MACHINERY—Wire Drawing
Aetna-Standard Engineering Co., Pittsburgh, Pa.
Cook Manufacturing Co., The, Paterson, N. J.
Coulter & McKenzie Machine Co., Bridgeport, Conn.
Herborn, Herborn, Germany
International Wire Products Corp., Midland Park, N. J.
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N. Y.
Schumag Schumacher Metallwerke, Aachen, Germany
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, Ohio
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Wire Forming
Baird Machine Co., The, Stratford, Conn.
Cosa Corporation, New York, N. Y.
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Wire Rope
Milton Machine Works, Inc., Milton, Pa.
New England Butt Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Watson Machine Co., Paterson, N. J.

MACHINERY—Wrapping with Paper
Terkelsen Machine Co., Boston, Mass.

MATERIAL HANDLING EQUIPMENT—
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

NAIL TOOLING—Tungsten Carbide
Firth Sterling, Inc., Pittsburgh, Pa.
Pittsburgh Carbide Die Co., Monongahela, Pa.

NAILS—Wire
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Sheffield Steel Corp., Kansas City, Mo.
Wickwire Brothers, Inc., Cortland, N. Y.

NOZZLES—For Extruding Machines
Wire Tool Div., Bridgeport Jig Boring Co., Bridgeport, Conn.

OVENS—Cable Lacquering
American Insulating Mach'y Co., Phila, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio
Industrial Ovens, Inc., Cleveland, Ohio
Rockwell Co., W. S., Fairfield, Conn.

OVENS—Rod Bakers
Carl-Mayer Corp., The, Cleveland, Ohio

OVENS—Welding Rod Coating
Carl-Mayer Corp., The, Cleveland, Ohio
Industrial Ovens, Inc., Cleveland, Ohio

PAINT BONDING CHEMICALS—
American Chemical Paint Co., Ambler, Pa.

PAINTS—Heat Resisting
American Chemical Paint Co., Ambler, Pa.

PAPER—Creped Wrapping
Arkell Safety Bag Company, New York, N. Y.
National Waterproof Papers, Inc., Beverly, N. J.
Terkelsen Machine Co., Boston, Mass.

PAPER—For Coil Wrapping and Corrosion Prevention
Arkell Safety Bag Company, New York, N. Y.
National Waterproof Papers, Inc., Beverly, N. J.
Terkelsen Machine Co., Boston, Mass.

PAPER—Insulating
Plymouth Cordage Co., Plymouth, Mass.

PATENT ATTORNEYS—
Lancaster, Allwine & Rommel, Washington, D. C.

PAY-OUT SYSTEMS—
(See MACHINERY—Take-Up & Pay-Out)

PHOSPHATE COATING CHEMICALS
(See COMPOUNDS—Phosphate Coating)

PICKLING COMPOUNDS—
See (Inhibitors—Pickling)

PICKLING—Hooks, etc. Acid Resisting
Youngstown Welding & Eng'g Co., Youngstown, Ohio

PICKLING TANK LININGS—
Chemsteel Construction Co., Pittsburgh, Pa.
Haveg Corp., Newark, Del.

PIPES & FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.

PLASTICS—for Wire Insulation
Electronic Rubber Co., Stamford, Conn.

PLIERS—For Wire
Utica Drop Forge & Tool Corp., Utica, N. Y.

POTS—Lacquer
Industrial Ovens, Inc., Cleveland, Ohio

PRESSES—Hydraulic and Mechanical
Aetna-Standard Engineering Co., Pittsburgh, Pa.

PULLERS AND GRIPS—For Wire
Morgan Construction Co., Worcester, Mass.
Scudder, E. J. Fdry. & Mach. Co., Trenton, N. J.
Sjogren Tool and Machine Co., Auburn, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, Ohio

PUMPS—Molten Metal
Fisher Associates, New York, N. Y.

REEL AND TENSION STANDS—
Fidelity Machine Company, Inc., Philadelphia
Industrial Ovens, Inc., Cleveland, Ohio.
New York Engineering Co., Yonkers, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Mill Supply Co., Pawtucket, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire Insulating Machy., Div. of Machinery Electrification, Inc., Northboro, Mass.

REEL CRUTCHES—
Watson Machine Co., Paterson, N. J.

REELS & SPOOLS—Aluminum Alloy
Acrometal Products, Inc., Minneapolis, Minn.
Hubbard Spool Co., Garrett, Ind.
Milton Machine Works, Inc., Milton, Pa.
Wardwell Braiding Machine Co., Central Falls, R. I.

REELS & SPOOLS—Annealing and Stranding
Acrometal Products, Inc., Minneapolis, Minn.
American Pulley Co., Philadelphia, Pa.
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Garrett, Ind.
Milton Machine Works, Inc., Milton, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Republic Steel Corp., Pressed Steel Div., Niles, Ohio

REELS—Metal Bound
Durkee Mfg. Co., Pine River, Minn.
Hubbard Spool Co., Garrett, Ind.
McCaskie, Inc., Wm., Westport, Mass.

REELS—Plywood
Hubbard Spool Co., Garrett, Ind.
McCaskie, Inc., Wm., Westport, Mass.
Nelson Company, The, Baltimore, Md.

REELS & SPOOLS—Steel (All Types)
Acrometal Products, Inc., Minneapolis, Minn.
American Pulley Co., Philadelphia, Pa.
Apco Mossberg Co., Attleboro, Mass.
Clark, J. L. Mfg. Co., Rockford, Ill.
Hubbard Spool Co., Garrett, Ind.
Mason Can Company, East Providence, R. I.
Milton Machine Works, Inc., Milton, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New York Engineering Co., Yonkers, N. Y.
Republic Steel Corp., Pressed Steel Div., Niles, Ohio
Wardwell Braiding Machine Co., Central Falls, R. I.

REELS—Wire Mill
Acrometal Products, Inc., Minneapolis, Minn.
American Pulley Co., Philadelphia, Pa.
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg. Co., The, Hazardville, Conn.
Durkee Mfg. Co., Pine River, Minn.
Hubbard Spool Co., Garrett, Ind.
Mason Can Company, East Providence, R. I.
McCaskie, Inc., Wm., Westport, Mass.
Mettler Machine Tool, Inc., New Haven, Conn.
Milton Machine Works, Inc., Milton, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New York Engineering Co., Yonkers, N. Y.

WHERE TO BUY, Continued

For more complete information, consult the annual Wire and Wire Products Buyers' Guide.

Republic Steel Corp., Pressed Steel Div., Niles, Ohio
Wardwell Braiding Machine Co., Central Falls, R. I.

REELS & SPOOLS—Wooden
American Woodworking Co., Chicago, Ill.
Bridge Mfg. Co., Inc., The, Hazardville, Conn.
Durkee Mfg. Co., Pine River, Minn.
Hubbard Spool Co., Garret, Ind.
Nelson Company, The, Baltimore, Md.

REFRACTORIES—High Temperature
Norton Company, Worcester, Mass.

ROD BAKERS—
(See OVENS—Rod Bakers)

RODS—Stainless Steel
American Steel & Wire Co., Cleveland, Ohio
Crucible Steel Co. of America, Pittsburgh, Pa.
Pittsburgh Steel Co., Pittsburgh, Pa.

RODS—Steel
Crucible Steel Co. of America, Pittsburgh, Pa.

RODS—Wire—Non-Ferrous
Chase Brass & Copper Co., Waterbury, Conn.
Kaiser Aluminum & Chemical Corp., Oakland, Calif.
Platt Bros. & Co., The, Waterbury, Conn.
Scovill Mfg. Co., Waterbury, Conn.

RODS—Wire, Steel
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Crucible Steel Co. of America, Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Sheffield Steel Corp., Kansas City, Mo.
Youngstown Sheet & Tube Co., Youngstown, O.

ROPE—Blocks
Madesco Tackle Block Co., Easton, Pa.

ROPE—Wire
American Steel & Wire Company, Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Roebling's, John A. Sons Corp., Trenton, N. J.

RUST PROOF COMPOUNDS—
(See COMPOUNDS—Rust Preventing)

RUST REMOVING COMPOUNDS—
(See COMPOUNDS—Rust Preventing)

SATURANTS—Cable
Carbro Chemical Company, Pawtucket, R. I.

SATURATION SYSTEMS—
Industrial Ovens, Inc., Cleveland, Ohio
New York Engineering Co., Yonkers, N. Y.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

SOAPS—Industrial and Wire Drawing
(See COMPOUNDS—Wire Drawing)

SPOOLS—(See Reels & Spools)

SPOOLS—Stamped Metal for Retail Wire Sales
Clark, J. L. Mfg. Co., Rockford, Ill.
Mason Can Co., East Providence, R. I.

STAMPINGS—Steel
Acrometal Products, Inc., Minneapolis, Minn.
Mossberg Pressed Steel Corp., Attleboro, Mass.

STRIP—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Roebling's, John A. Sons Corp., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

STRIPPERS—Wire, Electric
Utica Drop Forge & Tool Corp., Utica, N. Y.

TANKS—Compound
New York Engineering Co., Yonkers, N. Y.
Watson Machine Co., Paterson, N. J.

TANKS—Pickling and Plating
Chemsteel Construction Co., Pittsburgh, Pa.

TESTERS — INSULATION
(See MACHINERY—Spark Testers)

TESTING EQUIPMENT
(See MACHINERY Testing, Physical and Diameter Testing)

TINNING PROCESS—
Metal & Thermit Corp., New York, N. Y.

TINSEL—Electric Conductor
Montgomery Co., The, Windsor Locks, Conn.

TINSEL WIRE—Resistance, Lame, Decorative Cords Thread—Bare Copper, Silver and False Gold Coated, etc.
(See TINSEL—Electric Conductor)

TOOLS—Die Cutting and Finishing
Nord International Corporation, Orange, N. J.

TOOLS—Nail Machine
Pittsburgh Carbide Die Co., Monongahela, Pa.

TOOLS—Welding Wire, Strip & Foil (Pressure)
Utica Drop Forge & Tool Corp., Utica, N. Y.

TOOLS—Wire Cutting
Porter, H. K. Inc., Somerville, Mass.
Utica Drop Forge & Tool Corp., Utica, N. Y.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

TRANSMISSIONS—Variable speed (See Machy—Power Transmission)

TRAVERSES & DRUMS—For Reels
(See Drums & Traverses)

TRAVERSE MECHANISMS—
Apco Mossberg Co., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.
Wire Insulating Machy., Div. of Machinery Electrification, Inc., Northboro, Mass.

VALVES & FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.

VARNISHES & LACQUERS—for Electric Wire
Carbro Chemical Co., Pawtucket, R. I.
Chemical Products Co., E. Providence, R. I.

VULCANIZING PANS AND EQUIPMENT—
American Insulating Mach'y Co., Phila., Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Wire Insulating Machy., Div. of Machinery Electrification, Inc., Northboro, Mass.

WELDERS—Spot and Butt
Hoffman Co., Robt. W., Chicago, Ill.
Micro Products Co., Chicago, Ill.
Utica Drop Forge & Tool Corp., Utica, N. Y.

WIRE—Aluminum
Elmet Division, North American Philips Company, Inc., Lewiston, Maine
Kaiser Aluminum & Chemical Corp., Oakland, Calif.
Malin & Co., The, Cleveland, Ohio
Scovill Mfg. Co., Waterbury, Conn.

WIRE—Barbed
Interlocking Fence Co., Morton, Ill.

WIRE—Brass
Chase Brass & Copper Co., Waterbury, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Spencer Wire Corp., Union, N. J.

WIRE—Brush
Spencer Wire Corp., Union, N. J.

WIRE—Bunched & Stranded, Copper
Camden Wire Co., Camden, N. Y.

WIRE—Cast
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Cold Heading
American Steel & Wire Co., Cleveland, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Camden Wire Co., Camden, N. Y.
Chase Brass & Copper Co., Waterbury, Conn.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind
Crucible Steel Co. of America, Pittsburgh, Pa.
Kaiser Aluminum & Chemical Corp., Oakland, Calif.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Scovill Mfg. Co., Waterbury, Conn.
Sheffield Steel Corp., Kansas City, Mo.
Wickwire Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Copper
Chase Brass & Copper Co., Waterbury, Conn.
Spencer Wire Corp., Union, N. J.

WIRE—For Electrical Conductors
Camden Wire Co., Camden, N. Y.
Kaiser Aluminum & Chemical Corp., Oakland, Calif.

WIRE—Flat, Fine
Elmet Division, North American Philips Company, Inc., Lewiston, Maine
Montgomery Co., The, Windsor Locks, Conn.

WIRE—Galvanized
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Roebling's, John A. Sons Corp., Trenton, N. J.
Sheffield Steel Corp., Kansas City, Mo.
Wickwire Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Manufacturers
American Steel & Wire Co., Cleveland, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Chase Brass & Copper Co., Waterbury, Conn.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Crucible Steel Co. of America, Pittsburgh, Pa.
Johnson Steel & Wire Co., Worcester, Mass.
Kaiser Aluminum & Chemical Corp., Oakland, Calif.
Keystone Steel & Wire Co., Peoria, Ill.
National Lock Washer Company, The, Newark, N. J.
North American Philips Co., Inc., Elmet Division, Lewiston, Me.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Corp., Trenton, N. J.
Scovill Mfg. Co., Waterbury, Conn.
Sheffield Steel Corp., Kansas City, Mo.
Spencer Wire Corp., Union, N. J.
U. S. Steel Co., N. Y., N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Music
American Steel & Wire Co., Cleveland, Ohio
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Malin & Co., The, Cleveland, Ohio
Spencer Wire Corp., Union, N. J.

WIRE—Needle
Carpenter Steel Company, Webb Wire Division, New Brunswick, N. J.

WIRE—Nickel Silver and Phosphor Bronze
Alloy Metal Wire Div., H. K. Porter Co., Inc., Pittsburgh, Pa.
Chase Brass & Copper Co., Waterbury, Conn.
Malin & Co., The, Cleveland, Ohio

WIRE—Oil Tempered
Crucible Steel Co. of America, Pittsburgh, Pa.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Corp., Trenton, N. J.
Sheffield Steel Corp., Kansas City, Mo.

WIRE—Silver Plated Copper
Camden Wire Co., Camden, N. Y.

WIRE—Special Shapes
Alloy Metal Wire Div., H. K. Porter Co., Inc., Pittsburgh, Pa.
Crucible Steel Co. of America, Pittsburgh, Pa.
Continental Steel Corp., Kokomo, Ind.
National Lock Washer Company, The, Newark, N. J.

WIRE—Spring
Alloy Metal Wire Div., H. K. Porter Co., Inc., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Crucible Steel Co. of America, Pittsburgh, Pa.
Johnson Steel & Wire Co., Inc., Worcester
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Corp., Trenton, N. J.
Sheffield Steel Corp., Kansas City, Mo.
Wickwire Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Stainless Steel
American Steel & Wire Co., Cleveland, Ohio
Carpenter Steel Company, Webb Wire Div., New Brunswick, N. J.
Crucible Steel Co. of America, Pittsburgh, Pa.
Firth Sterling, Inc., Pittsburgh, Pa.
Major Co., J., Chicago, Ill.
National Lock Washer Company, The, Newark, N. J.
Pittsburgh Steel Co., Pittsburgh, Pa.

WIRE—Steel—Also Coppered and Galvanized Steel
Alloy Metal Wire Div., H. K. Porter Co., Inc., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Crucible Steel Co. of America, Pittsburgh, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Keystone Steel & Wire Co., Peoria, Ill.
Major Co., J., Chicago, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Corp., Trenton, N. J.
Sheffield Steel Corp., Kansas City, Mo.
Spencer Wire Corp., Union, N. J.
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O

WIRE—Straightening and Cutting
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Major Co., J., Chicago, Ill.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Tinned Copper
Camden Wire Co., Camden, N. Y.

WIRE—Tungsten
North American Philips Co., Inc., Elmet Division, Lewiston, Me.

WIRE—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

WRAPPING PAPER—Creped
(See PAPER—Creped Wrapping)

YARNS & TAPES—Insulating
Celanese Corporation of America, New York, N. Y.
Heineman Corp., Oscar, Chicago, Ill.
Pittsburgh Plate Glass Company, Pittsburgh, Pa.
Standard Film Products Corp., Pawtucket, R. I.

YARN TESTERS—
Scott Testers, Inc., Providence, R. I.

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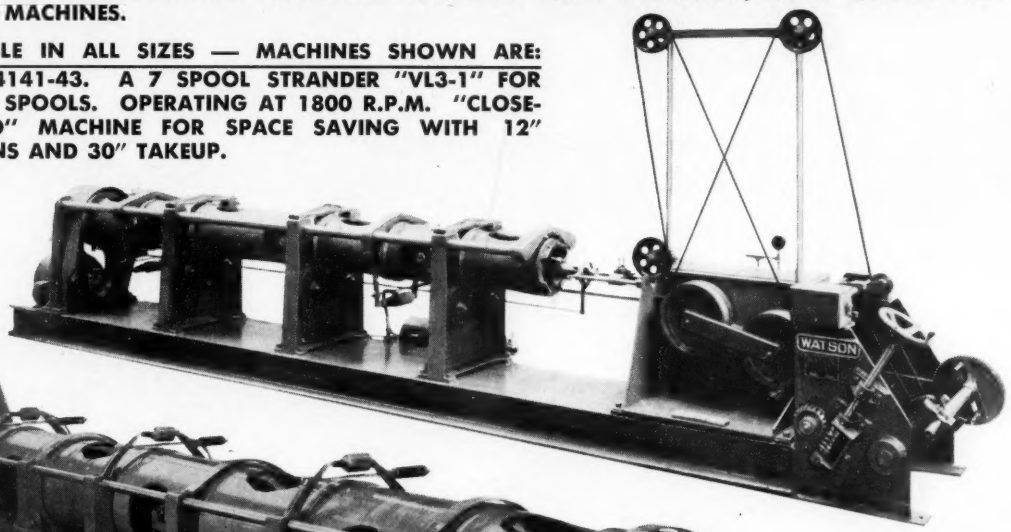

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HEAD "VL9-1" FOR
22" x 11" SPOOLS. OPERATING
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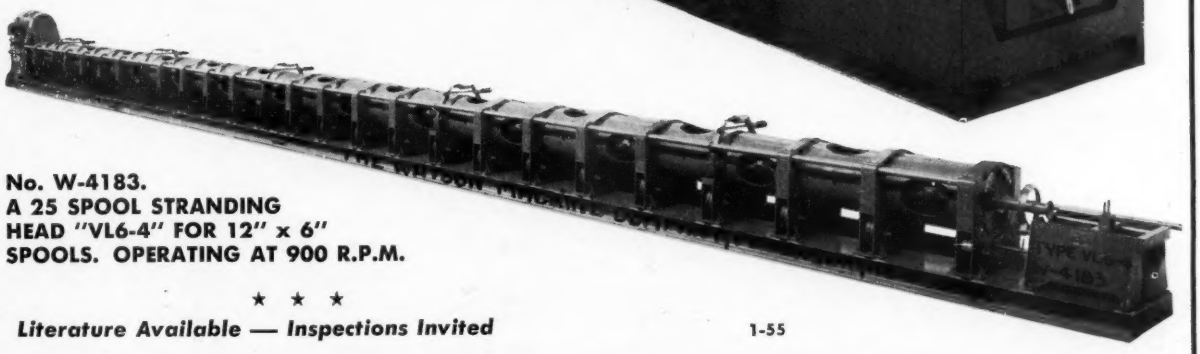
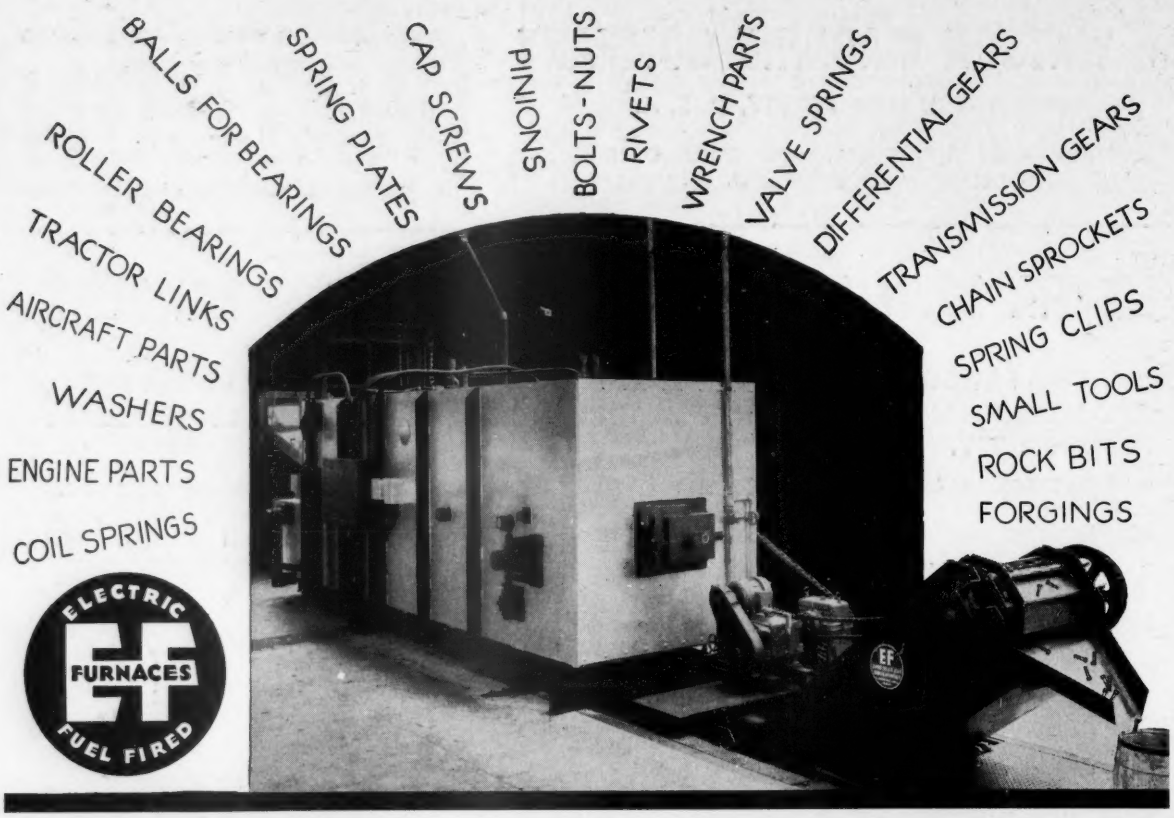


No. W-4183.
A 25 SPOOL STRANDING
HEAD "VL6-4" FOR 12" x 6"
SPOOLS. OPERATING AT 900 R.P.M.

★ ★ ★

Literature Available — Inspections Invited

1-55



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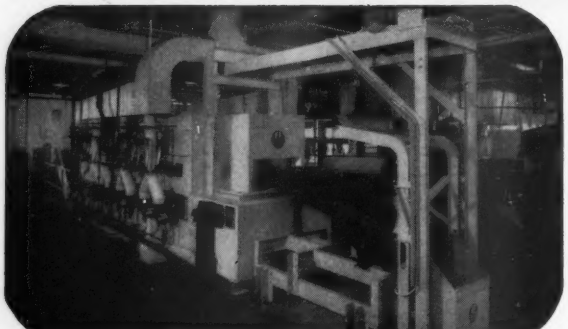

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